# THE 3-rd INTERNATIONAL SEMINAR ON SCIENCE AND TECHNOLOGY (ISST-3) 2021

**ISST 2021**

"The Path of Sustainable Development for a Better Life"

# BOOK OF ABSTRACTS

## 08-09 SEPTEMBER 2021

## FACULTY OF MATHEMATICAL AND NATURAL SCIENCES TADULAKO UNIVERSITY INDONESIA

# FOREWORD

Praise be to God Almighty for His Grace to make us success holding the 3-rd International Seminar on Science and Technology (ISST-3) 2021 with the theme: *The Path of Sustainable Development for a Better Life*. This international seminar is attended by lecturers and researchers in wide related fields of science and technology. The participants came from various universities and research institutes from 7 different countries, namely Australia, India, Japan, Korea, Mongolia, Malaysia, and Indonesia. There are 108 papers that will be presented (virtual presentation) ranging from Physics and Applied Physics, Environmental and Earth Science, Computational Science, Mathematical Sciences, Chemical Physics and Physical Chemistry, Material Physics, Material Analysis, and Characterization, Soft Matter, Liquids and Polymer, Electronic Devices. All the paper abstracts are presented in this Abstract Book.

Through this opportunity, on behalf of the ISST-3 Committee, we would like to thank the Rector of Tadulako University and the Dean of Faculty of Mathematics and Natural Sciences Untad for all given supports for the implementation of this international seminar. Our highest gratitude goes to the keynote speakers: Prof. Tatsuya Oshima (University of Miyazaki, Japan), Prof. Kyoung-Woong Kim (Gwangju Institute of Science and Technology, Korea) Dr. Xiaojing Zhou (Center for Organic Electronics, University of Newcastle, Australia), Prof. Dr. Eng. Kuwat Triyana, M.Si. (Gadjah Mada University, Indonesia), Prof. Dr. Andri Dian Nugraha, M.Si. (Bandung Institute of Technology, Indonesia), and Dr. Mohamad Rafi (IPB University, Indonesia). We also extend our great appreciation to the participants who came from various public and private universities as well as departmental and non-departmental institutions in Indonesia. The presence of you in this seminar contributes to the advance of science and technology.

Our deep apology if during this activity there are things not pleasing to our noble speaker, presenters, and all attendances. We congratulate you on participating in this seminar and wish you all the best.

Best regards,

**Elisa Sesa, Ph.D.**
The  ISST-3 Chairman

**Keynote Speakers**

**10.00-10.30**                    **Wednesday,  September 8, 2021**

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**Topic:**

**Application of Water Treatment Technology for Climate Change Adaptation**

**Prof. Dr. Kyoung-Woong Kim**



Director, International Environmental Research Institute (IERI).
Professor, School of Earth Sciences and Environmental Engineering
Gwangju Institute of Science and Technology (GIST), South Korea.

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This series of the international projects for 20 years aims to provide the solution for water and human health issue by securing sustainable and safe drinking water in areas vulnerable to the climate crisis including Indonesia with particular reference to improvement of the water quality supplied to health facilities and schools.

They include these activities;

1) Supplying low-cost and high-efficiency Gravity-Driven Membrane (GDM) for safe water supply for various situations and demands

2) Protecting vulnerable groups, including pregnant women and children, through the WASH (WAter, Sanitation & Hygiene) program

3) Improving awareness of hygiene and health through workshops and capacity-building training for local communities

4) Establishing long-term water quality management and GDM device maintenance system in the target area through the construction of local water quality monitoring laboratory

5) Contributing to gender equality by fostering female professionals via recruitment and education for water quality management and data analysis

From these activities, we can share these benefits;

1) Disseminating the low-cost and efficient GDM technology for climate change adaptation in many countries: Energy saving and carbon emission reduction

2) Preparing for the climate crisis and achieving the Sustainable Development Goals (SDGs) through the WASH program

3) Providing the opportunities for women to advance into society and contributing to gender equality by cultivating the female experts with the climate technology

4) Strengthening the technology cooperation network and promoting commercialization of climate technology

5) Helping to secure the Green Climate Fund (GCF) resources for continuous projects

# Keynote Speakers

**11.00-11.30**                    **Wednesday,  September 8, 2021**

**Topic:**

## Disposable Biosensor using Nanostructured Copper Oxide as the Catalysis to Detect Saliva-Ranged Glucose

**Dr. Xiaojing Zhou**

Priority Centre for Organic Electronics, School of Information and Physical Sciences, College of Engineering, Science and Environment, University of Newcastle, New South Wales, Australia, 2308

Flexible conductive graphene is an excellent electrode material for versatile applications in the field of nanomaterials.  Electrodeposition is an easy and inexpensive method that can be used to prepare metallic nanocrystals by simply varying the deposition conditions, such as overpotential, temperature, electrolyte concentration, and depositiontime. Sub-100 nm sized cubic copper/$Cu_2O$nanocrystals with a unique core-shell structurecan be effectively produced onto graphene strips. The obtained $Cu_2O$ nanocubes/graphene system is used as a high-performance glucose sensor with a wide detection range of $0.002-17.1mM$, as well as a high sensitivity appropriate for saliva-range glucose sensing. A prototype saliva-ranged disposable glucose biosensor has been developed,usingflex printing, anda three-terminal device structure that includesa printed silver strip as the reference electrode, two graphene strips as the working and counter electrodes.

09.00-09.30                    **Thursday,    September 9, 2021**

**Topic:**

**Au(III) extraction based on ion solvation using novel compounds with physical properties superior to current commercial extractants**

**Prof.TatsuyaOshima**



Department of Applied Chemistry, University of Miyazaki, 1-1, Gakuen Kibanadai Nishi, Miyazaki, Japan

Gold is used in electronic components, such as integrated circuits (ICs) and bonding wires. Solvent extraction is available as an efficient refining process for gold. After oxidative leaching of gold in acidic chloride media, gold is present as tetrachloroauric(III) acid ($HAuCl_4$) and can be extracted using oxygen-containing solvents such as ethers and ketones on the basis of ion solvation.

Dibutyl carbitol (DBC) and methyl isobutyl ketone (MIBK) are commercially available extractants for Au(III). These extractants show high Au(III) extractability, whereas their physical properties have drawbacks in extraction processes; aqueous solubility, low flash point. Recently, the authors have developed several solvents for Au(III) extraction. Aromatic 1,2-diethers were found to be suitable for the extraction of Au(III): 1,2-Dimethoxybenzene, in comparison with DBC, exhibits enhanced extraction selectivity toward Au(III) over that of Fe(III). Additionally, aliphatic ketone compounds also showed

good extractability for Au(III), with advantageous properties compared with conventional extractants. These ketone compounds have improved properties for metal processing compared with commercial extractants, namely, lower solubility in water, lower viscosity, and high flash points. A representative extractant, 2-nonanone, is available for the selectively extraction Au(III) over various metal ions and quantitative recovery of metallic gold by reduction.

# Keynote Speakers

**10.00-10.30**               **Thursday,    September 9, 2021**

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## Topic:

## Application of Metabolomics in Natural Product Research

**Dr. Mohamad Rafi,M.Si.**

Department of Chemistry, IPB University, Indonesia

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In the last few decades, metabolomics is widely used as a comprehensive approach in natural products research. Metabolomics is defined as a method of identification and systematic quantification of small molecules/metabolites resulting from the metabolism (metabolome) of a biological system (cell, tissue, organ, biological fluid, or organism) at a certain point in time as a consequence of a stimulus. Metabolomics will play a crucial role when studying phenotypes and changes in metabolites due to a treatment given to an organism. Several analytical strategies can be used in metabolomics, such as metabolite fingerprinting, metabolite profiling, targeted metabolites, and metabonomics. In metabolomics, knowledge of biology/biochemistry, instrumentation/analytical methods, and data mining (chemometrics) are necessary to interpret the research results obtained accurately. Currently, the metabolomics approach is widely used in research on the natural products from upstream like in agriculture (cultivation, harvesting, post-harvest raw materials, etc.) to downstream (development of herbal medicinal/food products, search for bioactive compounds, etc.) also in the development of quality control method of finished products (food, feed, herbal product, etc.). In this presentation, we will share some research on the application of metabolomics in natural products research in our group.

**Keywords**: *metabolomics, plants, natural products*

# CONFERENCE PROGRAMME
## The 3rd International Seminar on Science and Technology (ISST-3) 2021

| Day 1: Wednesday, September 8, 2021 |
|---|
| Venue : Tadulako University, Indonesia (via Zoom Meetings) |

| | |
|---|---|
| 08.30 – 09.00 | Participants start entering zoom meeting room |
| 09.00 – 10.00 | Welcoming Remarks |
| | Indonesian National Anthem: **Indonesia Raya** |
| | Video Profile Presentation of Tadulako University |
| | Recitation of Prayer |
| | Welcome Address by Conference Chairman |
| | Inauguration Address by Rector of Tadulako University |
| | Photo Session (via zoom meeting) |
| 10.00 – 12.00 | **Plenary Session I** |
| 10.00 – 10.30 | • Prof. Kyoung-Woong Kim (Gwangju Institute of Science and Technology, South Korea) |
| 10.30 – 11.00 | • Prof. Dr. Eng. Kuwat Triyana, M.Si (Department of Physics, Gadjah Mada University, Indonesia) |
| 11.00 – 11.30 | • Dr. Xiaojing Zhou (Center for Organic Electronics, University of Newcastle, Australia) |
| 11.30 – 12.00 | Discussion session |
| 12.00 – 13.00 | Breaks |
| 13.00 – 17.00 | Parallel Sessions |

| Day 2: Thursday, September 9, 2021 |
|---|
| Venue : Tadulako University, Indonesia (via Zoom Meetings) |

| | |
|---|---|
| 08.30-09.00 | Participants start entering zoom meeting room |
| 09.00 – 11.00 | **Plenary Session II** |
| 09.00 – 09.30 | • Prof. Tatsuya Oshima (University of Miyazaki, Japan) |
| 09.30 – 10.00 | • Prof. Dr. Andri Dian Nugraha, S.Si., M.Si. (Bandung Institute of Technology, Indonesia) |
| 10.00 – 10.30 | • Dr. Mohamad Rafi, M.Si. (Department of Chemistry, IPB University, Indonesia) |
| 10.30 – 11.00 | Discussion Session |
| 11.00 – 13.00 | Breaks |
| 13.00 – 16.00 | Parallel Sessions |
| 16.00 – 17.00 | Closing of 3rd- International Seminar on Science and Technology |

**LIST OF CHAIRPERSONS FOR PARALLEL SESSION**

**Parallel Session Coordinator**
**(Elisa Sesa, Ph.D)**

| Day 1 : Wednesday, September 8, 2021 | | | | |
|---|---|---|---|---|
| **Zoom Meeting Room 1** **Sessionchair** | **Zoom Meeting Room 2** **Sessionchair** | **Zoom Meeting Room 3** **Sessionchair** | **Zoom Meeting room 4** **Sessionchair** | **Zoom Meeting Room 5** **Sessionchair** |
| Dr. Erwin Abdul Rahim | Dr. Nov Irmawati Inda | Elisa Sesa, Ph.D. | Icha Untari Meidji, S.Si., M.Sc. | Lilies Handayani, S.Si., M.Si. |
| Day 2 : Thursday, September 9, 2021 | | | | |
| **Zoom Meeting Room 1** **Sessionchair** | **Zoom Meeting Room 2** **Sessionchair** | **Zoom Meeting Room 3** **Sessionchair** | **Zoom Meeting room 4** **Sessionchair** | **Zoom Meeting Room 5** **Sessionchair** |
| Pasjan Satrimafitrah, Ph.D. | M. Rinaldhi Tandah, S.Si., M.Sc. Apt | Dr. Sabhan, M.Si. | Icha Untari Meidji, S.Si., M.Sc. | Junaidi, Ph.D. |

# PARALLEL SESSIONS BY PARTICIPANTS' ID

| \*Wednesday, September 8, 2021\* | | | | |
|---|---|---|---|---|
| **TIME** | **ROOM 01** | **ROOM 02** | **ROOM 03** | **ROOM 04** | **ROOM 05** |
| 13.00 - 13.15 | ISST-3_001 | ISST-3_030 | ISST-3_005 | ISST-3_031 | ISST-3_013 |
| 13.15 - 13.30 | ISST-3_002 | ISST-3_041 | ISST-3_007 | ISST-3_043 | ISST-3_016 |
| 13.30 - 13.45 | ISST-3_003 | ISST-3_045 | ISST-3_008 | ISST-3_044 | ISST-3_017 |
| 13.45 - 14.00 | ISST-3_004 | ISST-3_046 | ISST-3_009 | ISST-3_055 | ISST-3_018 |
| 14.00 - 14.15 | ISST-3_011 | ISST-3_047 | ISST-3_010 | ISST-3_056 | ISST-3_020 |
| 14.15 - 14.30 | Break | | | | |
| 14:30 – 14:45 | ISST-3_012 | ISST-3_063 | ISST-3_014 | ISST-3_057 | ISST-3_084 |
| 14.45 - 15.00 | ISST-3_015 | ISST-3_068 | ISST-3_025 | ISST-3_058 | ISST-3_085 |
| 15.00 - 15.15 | ISST-3_019 | ISST-3_069 | ISST-3_026 | ISST-3_062 | ISST-3_091 |
| 15.15 - 15.30 | ISST-3_022 | ISST-3_072 | ISST-3_027 | ISST-3_065 | ISST-3_092 |
| 15.30 – 15.45 | ISST-3_023 | ISST-3_104 | ISST-3_028 | ISST-3_066 | ISST-3_093 |
| 15.45 - 16.00 | ISST-3_106 | ISST-3_107 | - | ISST-3_108 | ISST-3_095 |
| \*Thursday, September 9, 2021\* | | | | |
| **TIME** | **ROOM 01** | **ROOM 02** | **ROOM 03** | **ROOM 04** | **ROOM 05** |
| 13.00 - 13.15 | ISST-3_032 | ISST-3_039 | ISST-3_029 | ISST-3_006 | ISST-3_021 |
| 13.15 - 13.30 | ISST-3_033 | ISST-3_040 | ISST-3_067 | ISST-3_024 | ISST-3_051 |
| 13.30 - 13.45 | ISST-3_034 | ISST-3_077 | ISST-3_070 | ISST-3_042 | ISST-3_061 |
| 13.45 - 14.00 | ISST-3_035 | ISST-3_087 | ISST-3_074 | ISST-3_048 | ISST-3_064 |
| 14.00 - 14.15 | ISST-3_036 | ISST-3_094 | ISST-3_075 | ISST-3_049 | ISST-3_073 |
| 14.15 - 14.30 | | | | | |
| 14.30 - 14.45 | ISST-3_037 | ISST-3_098 | ISST-3_076 | ISST-3_050 | ISST-3_078 |
| 14.45 - 15.00 | ISST-3_038 | ISST-3_099 | ISST-3_079 | ISST-3_052 | ISST-3_080 |
| 15.00 - 15.15 | ISST-3_071 | ISST-3_100 | ISST-3_082 | ISST-3_053 | ISST-3_081 |
| 15.15 - 15.30 | ISST-3_088 | ISST-3_101 | ISST-3_089 | ISST-3_059 | ISST-3_083 |
| 15.30 – 15.45 | ISST-3_096 | ISST-3_102 | ISST-3_090 | ISST-3_060 | ISST-3_086 |
| 15.45 - 16.00 | ISST-3_054 | - | ISST-3_105 | ISST-3_103 | ISST-3_097 |

# PARALLEL SESSIONS SCHEDULE

| Wednesday, September 8, 2021 | | |
|---|---|---|
| ROOM 01 | | |
| TIME | Date | Title |
| 13.00 - 13.15 | ISST-3_001 | Sea Phytoplankton Identification Isochrysis aff galbana, Spirulina sp., Thalassiosira sp., and Nitzchia sp. to Cultivate in MSSIP-2 Medium for Production Biomass and Carbohydrates |
| 13.15 - 13.30 | ISST-3_002 | Coagulation and Filtration mthods application to decrease iron (Fe(II)) and manganese (Mn(II)) ions in soil water from Centre Antapani Bandung |
| 13.30 - 13.45 | ISST-3_003 | Assessment of Water stability and Water quality status of urban Patna (Bihar), India |
| 13.45 - 14.00 | ISST-3_004 | Detection of Thiamine using Differential Pulse Anodic Stripping Voltammetry |
| 14.00 - 14.15 | ISST-3_011 | An Ethnomedicinal study of Medicinal Plants Used against Gastrointestinal Complaints By "Kaili Ledo Ethnic" in Central Sulawesi, Indonesia |
| 14.15 – 14.30 | | BREAK |
| 14.30 - 14.45 | ISST-3_012 | Antibacterial Properties Of Composite Polieugenol/ZnO Material |
| 14.45 - 15.00 | ISST-3_015 | Polyphenol in sappan wood (Caesalpinia sappan L.) extract results of ultrasonic assisted solvent extraction |
| 15.00 - 15.15 | ISST-3_019 | Synthesis of Edible Film From Agar of Seaweed (Gracillaria sp.) Using Glycerol as Plasticizer With Addition of Carboxymethyl Cellulose (CMC) |
| 15.15 - 15.30 | ISST-3_022 | The effect of Arginine addition in the diets of laying hens on characteristics and quality of eggs stored for 14 days |
| 15.30 – 15.45 | ISST-3_023 | Reproductive response of cross-bred between local male chicken and commercial laying hens fed selenium-added diets |
| 15.45 – 16.00 | ISST-3_106 | Preparation of Biochar from Ketapang Shells (Terminalia catappa L.) for Dyes Adsorbent to Support Environmental Principles |
| ROOM 02 | | |
| TIME | Date | Title |
| 13.00 - 13.15 | ISST-3_030 | The Effect of pH and Incubation Temperature on The Activity of Bromelain Pineapple Hump (Ananas comosus) Amobilized Sea Sand |
| 13.15 - 13.30 | ISST-3_041 | Effect Comparative Composition of Geopolymer Based- Bottom Ash and Brick Ash to be Apllied as Refractories |
| 13.30 - 13.45 | ISST-3_045 | Comparative Study of Beta Radiation Dose in Si homojunction and ZnO-Si heterojunction with Pm-147 Radioisotope For Betavoltaic Application |
| 13.45 - 14.00 | ISST-3_046 | Pullout Strength Evaluation of Titanium Pedicle Screw at Different Grade of Polyurethane |
| 14.00 - 14.15 | ISST-3_047 | Reduction of COD and BOD of Palm Oil Mill Effluent by The Palm Frond (Elaeis guenensis Jacq) Activated Charcoal |
| 14.15 – 14.30 | | BREAK |

| TIME | Date | Title |
|---|---|---|
| 14.30 - 14.45 | ISST-3_063 | Screening and identification of thermophilic uricase bacteria from the Mata Umpana Hot Spring, Buton Regency, Southeast Sulawesi |
| 14.45 - 15.00 | ISST-3_068 | The Study of Phosphate Using Ferryhydrite as Binding Layer With Diffusive Gradient in Thin Films Method |
| 15.00 - 15.15 | ISST-3_069 | Desorption β-carotene of Crude Palm Oil (CPO) from Clay Using n-hexane |
| 15.15 - 15.30 | ISST-3_071 | Biosynthesis of Silver Nanoparticles using Lannea coromandelica Bark Extract: Comparative Study with Polyvinyl Alcohol (PVA) and Polyacrylic Acid (PAA) as Stabilizing Agents |
| 15.30 – 15.45 | ISST-3_072 | Study of Cadmium Adsorption Using Nata De Coco Cellulose Modified Diethylentriamine |
| 15.45 - 16.00 | ISST-3_107 | Adsorption Biocharcoal from Shell and Fruit Stems of Palm in Removal Fe Ions |
| **ROOM 03** | | |
| TIME | Date | Title |
| 13.00 - 13.15 | ISST-3_005 | Sensitivity enhancement of muscle contraction sensors at various configurations on plastic optical fiber |
| 13.15 - 13.30 | ISST-3_007 | Press Tool for the V-Bending Process of Stainless Steel Plate: Designing and Manufacturing |
| 13.30 - 13.45 | ISST-3_008 | X-ray Diffraction Analysis of TiO2 Nanoparticles doped Co and Cu by Williamson–Hall (UDM) and Size-Strain Plot (SSP) Methods |
| 13.45 - 14.00 | ISST-3_009 | Structural and optical properties of AZO/TiO2 hetero-structures thin films on ITO substrates for solar cell application |
| 14.00 - 14.15 | ISST-3_010 | Smart Trash Bin Design: Automatic Garbage Sorter Based on Capacitive Proximity Sensor and Object Recognition |
| **14.15 – 14.30** | **BREAK** | |
| 14.30 - 14.45 | ISST-3_014 | The Effect of Additional Co-Doping Cobalt (Co), Nickel (Ni) on The Material Properties of Zinc Oxide (ZnO) Nanoparticles |
| 14.45 - 15.00 | ISST-3_025 | Analysis of the changes power output and irradiation dose laser on OD and MDA values from photoinactivation treatment against Candida albicans and Staphyloccocus epidermidis biofilms with green lasers |
| 15.00 - 15.15 | ISST-3_026 | The analysis of potency of Jarak leaf Extract (Jatropha Curcas L.) after radiating with red laser to inhibiting the growth of oxygenated Staphylococcus epidermidis Biofilm cells |
| 15.15 - 15.30 | ISST-3_027 | Synthesis of Hydroxyapatite from Duck Egg Shells With Precipitation Method for Biokeramics Applications |
| 15.30 – 15.45 | ISST-3_028 | Effect of Magnetic Field Exposure from Helmholtz Coils on Bidara Plant Germination |
| **ROOM 04** | | |
| TIME | Date | Title |
| 13.00 - 13.15 | ISST-3_031 | The Effect of Light Intensity and Heating Chlorophyll Extract Ipomea reptans Poir as a Sensitizer |
| 13.15 - 13.30 | ISST-3_043 | Drone for Disaster Monitoring, Case Study : Multi Disaster In Palu And Sigi After 28 September 2018 |

| TIME | Date | Title |
|---|---|---|
| 13.30 - 13.45 | ISST-3_044 | Drone for Disaster Monitoring, Case Study : Multi Disaster In Palu And Sigi After 28 September 2018 |
| 13.45 - 14.00 | ISST-3_055 | Physicochemical study of extracts of Jarak leaf (Jatropha curcas L.) and Papaya leaf (Carica papaya L.) and their application as photosensitizer agents in aPDT system of Staphylococcus epidermidis biofilm |
| 14.00 - 14.15 | ISST-3_056 | Estimation of CT Number Linearity and Uniformity of Computed Tomography Scan by using Water CIRS Phantom at the Sayang Rakyat Hospital of Makassar |
| **14.15 – 14.30** | | **BREAK** |
| 14.30 - 14.45 | ISST-3_057 | Geometry Transformation Digital Online Book With Guided Note Taking (Gnt) Model for Distance Learning |
| 14.45 - 15.00 | ISST-3_058 | E-book media vector and coordinate system with augmented reality in pandemic period |
| 15.00 - 15.15 | ISST-3_062 | Java Modules For Electronic Structure Calculations Using Density Functional Theory And Plane Wave |
| 15.15 - 15.30 | ISST-3_065 | Noise Level Analysis Using the Noise Level Distribution Pattern Approach in the Masomba Market and Manonda Market, Palu, During the Covid-19 Pandemic |
| 15.30 – 15.45 | ISST-3_066 | Synthesis of Hematite (Fe2O3) Nanoparticles Based on Iron Sand, Talaga Village, Dampelas District Using Precipitation Method and its Application as Nanocatalyst |
| 15.45 – 16.00 | ISST-3_108 | Analysis of the changes power output and energy dose of green laser against OD and MDA values after photoinactivation to Candida albicans and Staphyloccocus epidermidis biofilms |
| **ROOM 05** | | |
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_013 | Application of Fuzzy Time Series to Forecast COVID-19 Cases in Central Sulawesi |
| 13.15 - 13.30 | ISST-3_016 | Cost-effectiveness analysis on a typhoid model with intervention of vaccination, treatment, and healthy life campaign |
| 13.30 - 13.45 | ISST-3_017 | The Application of Indicator Kriging (Ik) on Interpolation the Content of Laterite Nickel Mines at PT. Raihan Catur Putra |
| 13.45 - 14.00 | ISST-3_018 | Clustering Quality Bawang Merah Palu (*Alliumascalonium L.*) Using Kohonen Algorithm |
| 14.00 - 14.15 | ISST-3_020 | Grouping of Districts/Cities in Central Sulawesi Province Based on Natural Disasters Using Fuzzy Subtractive Clustering |
| **14.15 – 14.30** | | **Break** |
| 14.30 - 14.45 | ISST-3_084 | Preliminary Result : Characteristics of Ambient Seismic Noise as A Source for Surface Wave Tomography in South Arm of Sulawesi and Its Surroundings |
| 14.45 - 15.00 | ISST-3_085 | Multivariate Profile Analysis to Identify Characteristics of Climate in Palu City, Indonesia |
| 15.00 - 15.15 | ISST-3_091 | Prediction of Changes in the Phreatic Level Using a Hydrogeological Approach in Post Liquifaction Disasters at the Petobo Area, Palu Groundwater Basin, Central Sulawesi Province |

| 15.15 - 15.30 | ISST-3_092 | Sustainable Groundwater Development Based on Characteristics of Aquifers in Phase IA Pombewe Permanent Occupancy at Sigi Regency, Central Sulawesi Province |
|---|---|---|
| 15.30 – 15.45 | ISST-3_093 | Earthquake Hazard Level in Mamuju district |
| 15.30 – 15.45 | ISST-3_095 | The Control Model of Yellow Rice Stem Borer (*Scirpophaga Incertulas Walker*) by Utilizing the Egg Parasitoid (*Telenomus Rowani Gahan*) |

| **Thursday, September 9, 2021** | | |
|---|---|---|
| **ROOM 01** | | |
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_032 | Electrochemical Performance of Graphene Paste Electrode Modified TiO2-Calix[4]Arene (G@TC) as a Cd2+ Ion Detection |
| 13.15 - 13.30 | ISST-3_033 | Highly sensitive determination of Pb (II) ions using graphene paste electrode modified TiO2-ionophore calix[6]arene composite |
| 13.30 - 13.45 | ISST-3_034 | Electroanalytical measurement using carbon paste electrode modified TiO2/Ag-Li (CPE-TiO2/Ag-Li) in detection of fipronil compound |
| 13.45 - 14.00 | ISST-3_035 | Bioethanol production based on OPEFB biomass using sulfuric acid followed by saccharification and co-fermentation simultaneously |
| 14.00 - 14.15 | ISST-3_036 | Calcination Temperature Effect of Chicken Eggshells as A Heterogeneous Catalyst on The Biodiesel Production from Moringa Seed Oil |
| **14.15 – 14.30** | | **BREAK** |
| 14.30 - 14.45 | ISST-3_037 | Synthesis and Characterization of Electrode Ag-S-TiO2/Ti for Enhanced Photocatalytic Degradation of Methylene Blue |
| 14.45 - 15.00 | ISST-3_038 | Inhibitory activity of Candida albicans fungi by acetone extract of the lichen Usnea sp. |
| 15.00 - 15.15 | ISST-3_071 | Biosynthesis of Silver Nanoparticles using Lannea coromandelica Bark Extract: Comparative Study with Polyvinyl Alcohol (PVA) and Polyacrylic Acid (PAA) as Stabilizing Agents |
| 15.15 - 15.30 | ISST-3_088 | Extraction properties of Cu(II) from aqueous solution with PVA/Alg cross-linked gel microcapsules immobilizing fine droplets of phenolic oxime extractant |
| 15.30 – 15.45 | ISST-3_096 | Effect of polystyrene microcapsules containing CaCl2 aqueous solution on mechanical strength and curing process of Portland cement mortar |
| 15.45 – 16.00 | ISST-3_054 | Antioxidant, Total Phenolic Content and Antibacterial Activity of leaves extract from local and endemic Nepenthes maxima Reinw. ex Ness from Poso, Central Sulawesi. |
| **ROOM 02** | | |
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_039 | Antibacterials activity of Escherichia coli and Salmonella typhi by acetone extract of the lichen Usnea sp. |
| 13.15 - 13.30 | ISST-3_040 | Antioxidant and Antidiabetic Activity of Rhizophora Mucronata Mangrove Leaf Extract |
| 13.30 - 13.45 | ISST-3_077 | Pine resin utilization as binding agent for densification of coconut shells and rice husks at various pressures |

| 13.45 - 14.00 | ISST-3_087 | Repeated Use of Bromelain Immobilized on Alginate Membrane for Virgin Coconut Oil Production |
|---|---|---|
| 14.00 - 14.15 | ISST-3_094 | The Effect of Scarification with Different Level of Sulphuric Acid on Seed Germination and Seedling Growth of Indigofera zollingeriana Miq |
| **14.15 – 14.30** | **Break** | |
| 14.30 - 14.45 | ISST-3_098 | Changes in Low Rank Coal Properties and Carbon Dioxide Absorbability |
| 14.45 - 15.00 | ISST-3_099 | Rock Slope Stability Studies at Selinsing Gold Mine, Pahang |
| 15.00 - 15.15 | ISST-3_100 | Computerised Tomography Application: Coal Integration between sorption to Carbon Dioxide |
| 15.15 - 15.30 | ISST-3_101 | Deterioration and Defect in Concrete Bridge Structures: Alkali-Silica Reaction |
| 15.30 – 15.45 | ISST-3_102 | Delayed Ettringite Formation in Marine Environment and Relationship with Sulphate Attack |

| ROOM 03 | | |
|---|---|---|
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_029 | The propagation pattern of the tidal constituents based on the tide height in Tomini Bay, Central Sulawesi Province. |
| 13.15 - 13.30 | ISST-3_067 | Filter of Composite Ore Manganese and Activated Carbon Coconut shell for Water Purification |
| 13.30 - 13.45 | ISST-3_070 | Review of Low-level Wind Shear: Detection and Prediction |
| 13.45 - 14.00 | ISST-3_074 | The Arduino-based Instrument for Energy Conservation Law |
| 14.00 - 14.15 | ISST-3_075 | Mangrove Health Tester: Arduino-based Mangrove Health Detection Innovation As The First Step In Mitigating The Tsunami Disaster In Palu City, Central Sulawesi |
| **14.15 – 14.30** | **BREAK** | |
| 14.30 - 14.45 | ISST-3_076 | Physical Characteristics of Donggala Limestone-based Hydroxyapatite |
| 14.45 - 15.00 | ISST-3_079 | Water mass analysis in the Balikpapan Bay, East Kalimantan, Indonesia |
| 15.00 - 15.15 | ISST-3_082 | Design of Concentrated Solar Thermal Powered Heat Exchanger Completed with Energy Storage Material |
| 15.15 - 15.30 | ISST-3_089 | Evaluation of surface dose in diagnostic radiology procedures |
| 15.30 – 15.45 | ISST-3_090 | Impact Contrast Agent in Dose Calculation Radiation for Therapy Planning: Study of Water Phantom |
| 15.45 – 16.00 | ISST-3_105 | Characteristics of Co-combustion of Low-Rank Coal Mixed with Cocoa Pod Husk |

| ROOM 04 | | |
|---|---|---|
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_006 | Characteristics of Joints on the Saddang Fault in Tana Toraja |
| 13.15 - 13.30 | ISST-3_024 | Ground Penetrating Radar Application for Identification of Subsurface Deformation and Fractures at Tadulako University Campus Palu |
| 13.30 - 13.45 | ISST-3_042 | Identification of the Subsequent Surface Layer of the Liquifaction Regions of Jono Oge, Lolu and Sidera Villages Using Geo-Electrical Method |
| 13.45 - 14.00 | ISST-3_048 | The Identification of Fault in Sibedi Village, Marawola Subdistrict, Sigi Regency, Using Geoelectrical Resistivity Method |
| 14.00 - 14.15 | ISST-3_049 | Application of the Resistivity Method in the Investigation of Subsidence And Soil Creep Case Study of the Balikpapan - Samarinda Road Section, Indonesia |
| **14.15 – 14.30** | | **BREAK** |
| 14.30 - 14.45 | ISST-3_050 | Estimation of Depth And Characteristics of Subsurface Acuifer Layer Using Resistivity Method in Lansot Village, North Minahasa District, Indonesia |
| 14.45 - 15.00 | ISST-3_052 | Signal Characteristics Bromo Volcano Eruption In 2015 Based on Time-Frequency Analysis (TFA) |
| 15.00 - 15.15 | ISST-3_053 | Identification of Surface Faults Using the Resistivity Geoelectrical Method in Dalaka Village, Donggala Regency, Central Sulawesi |
| 15.15 - 15.30 | ISST-3_059 | Characteristics of Rock Mass in Leang-Leang Ancient Park Karst Maros Tn Bantimurung Bulusaraung Area |
| 15.30 – 15.45 | ISST-3_060 | Preliminary Shear Wave Velocity Profiling Analysis for Site Classification of Tadulako University Using Microtremor Measurements |
| 15.30 – 16.00 | ISST-3_103 | Geological Hazards that Occured on September 28th, 2018 in Sirenja Sub-District Donggala Regency, Central Sulawesi Province, Indonesia |
| ROOM 05 | | |
| **TIME** | **Date** | **Title** |
| 13.00 - 13.15 | ISST-3_021 | Web-Based Decision Supporting System in Determining the Right Strategy for Small and Medium Enterprises Local Fried Onions in Palu to Survive in the COVID-19 Situation |
| 13.15 - 13.30 | ISST-3_051 | Identification of rainfall variability in the Northern coast of Java |
| 13.30 - 13.45 | ISST-3_061 | Tectonic features beneath Bali and Nusa Tenggara islands revealed from seismic tomography of P-wave: a preliminary result |
| 13.45 - 14.00 | ISST-3_064 | Subsurface Identification of Landslide Using Geo-electrical Method in Karang Joang, East Kalimantan |
| 14.00 - 14.15 | ISST-3_073 | Seismicity of South Sulawesi Based on b Value and Its Seismic Potential |
| **14.15 – 14.30** | | **BREAK** |
| 14.30 - 14.45 | ISST-3_078 | Geochronology of Geological Structure Lineation in The Palu-Koro Fault Zone |
| 14.45 - 15.00 | ISST-3_080 | Simulation of climate comfort index based on temperature humidity index for projection of climate comfort level around Makassar City during 2017-2099 |

| | | |
|---|---|---|
| 15.00 - 15.15 | ISST-3_081 | Ground Motion Characterization Based on Shear Wave Velocity in The Sigi Goverment Office Area. |
| 15.15 - 15.30 | ISST-3_083 | Landslide Investigation Through Surface Geological Study and Photogrammetry Methods in Poi Area, Sigi Regency Central Celebes |
| 15.30 – 15.45 | ISST-3_086 | Analysis The Relationship Between Exports, Imports, BI Rate, Exchange Rate (USD/IDR), Money Supply (M2) and Indonesia's Foreign Exchange Reserves |
| 15.30 – 16.00 | ISST-3_097 | Bootstrap Aggregating on Logistic Regression To Labor Force Participation Rate |

# Sea Phytoplankton Identification *Isochrysis aff galbana, Spirulina sp., Thalassiosira sp., and Nitzchia sp*. ToCultivate in MSSIP-2 Medium for Production Biomassand Carbohydrates

Syahruddin Kasim[1*] and Afhdhaliatul Khumairah[2]

*[1]Department of Chemistry, Faculty of Mathematics and Natural Sciences Hasanuddin University, Makassar*

*[*]Email: kasimsyahruddin@gmail.com*

## Abstract

The research for isolate and identify of sea phytoplanktons for biomass production and determination of carbohydrate content. Sea phytoplanktons was cultivated in medium with "MSSIP-2" nutrient to multiply seeds and cultivate stocks. In the mass media cultivation, isolation and identification of sea phytoplankton was done based on size and certain characteristics. The measurement of temperature, salinity and pH solution also done in the media. The biomass weight of the density of selected phytoplankton was done by gravimetric method and the carbohydrate content was analyzed by glucose determination with Luff Schoorl. The isolation results indicate six types of sea phytoplankton: Isochrysis aff galbana, Spirulina sp., Thalassiosira sp., and Nitzchia sp. Specific growth rate of phytoplankton cells density is highest 0.0321 cells/hour at Isochrysis aff galbana and the lowest 0.0277 cells/hour at Thalassiosira sp. The highest biomass content 0.34 g.L-1 is Isochrysis aff galbana and the lowest 0.27 g.L-1 is Nitzchia sp.. The carbohydrate content is also varied, the highest 33.98% is Isochrysis aff galbana and the lowest 28.16% is Thalassiosira sp.

**Keywords:***Type of sea phytoplankton, Biomass production, Carbohydrate content, Phytoplankton culture, MSSIP-2 nutrient*

# Coagulation and Filtration mthods application to decrease iron (Fe(II)) and manganese (Mn(II)) ions in soil water from Centre Antapani Bandung

Muhammad Yudhistira Azis[1] , Yoan Martha Aulia[2] , Anggi Suprabawati[2]

*[1]Analytical Chemistry Research Division, Chemistry Department, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Jl. Ganesha No 10 Bandung 40132*
*[2]Physical Chemistry Research Group, Chemistry Department, Faculty of Science and Informatic, University of Jendral Achmad Yani, Jl. Terusan Jend.Sudirman, Cibeber, Kec. Cimahi Selatan, Kota Cimahi, Jawa Barat 40531 C*
*Corresponding author's: m.yudhistira.azis@mail.chem.itb.ac.id*

## Abstract

Nowadays the quality of groundwater in Kelurahan Antapani Tengah is unconsumable and.potentially polluted. Its visual properties were changed and toxic and harmful for human and environment. The most problem caused potentially contains of Fe and Mn. Removal these metals with selected coagulation-flocculation and filtration method need to evaluated in gtoundwater sample. The purposes of this research are to analyze the content of Fe and Mn of groundwater sample in Kelurahan Antapani Tengah Kota Bandung using UV-Vis spectrophotometry, to analyze and also evaluate the reduction of Fe and Mn content by coagulation and filtration methodes. The reduction by using filtration methode for Fe is 93.91% and Mn 96.96%. By coagulation-flocculation reduced Fe 98.04% and Mn 95.26%. By combine methods of coagulation-flocculation and filtration reduced Fe 99.10% and Mn 97.72% with optimum dosage PAC and PAM are 50 mg/L and 5 mg/L.

**Keywords:***Coagulation, Flocculation, Filtration, Iron(Fe), Manganese(Mn)*

# Assessment of Water stability and Water quality status of urban Patna (Bihar), India

Saurabh Kumar*, Ashutosh Kumar and Reena Singh

*Department of Civil Engineering, National Institute of Technology, Patna, Mahendru 800005, Bihar, India*

*\*E-mail:saurabh.ce18@nitp.ac.in*

## Abstract

The main focus of this study is to show the status of water quality in urban Patna, Bihar. As when water is contaminated with physical and chemical contaminants, public health is at high risk, which may have an immediate health effect. For finding the status of water quality total of 36 samples were collected at 18 locations in Patna, Bihar. The physicochemical parameters were analysed. For achieving these goals, two tools have been used such as the Water quality index and Corrosiveness index were calculated. The weighted arithmetic method was used for water quality analysis in which a total of 12 parameters were used for the calculation of WQI. LSI, RSI, AI, PSI, and LS were used for finding water stability. As per WQI, 3 stations are graded as "A", 9 stations as "B", and 6 stations as "C", the value is in a range between 7.869 to 92.346. As per Corrosion indices, LSI stated that 88.89% selected sites were found corrosive and 11.11% site was scaling, RSI stated all sites was corrosive, PSI stated that 88.89% sites were corrosive and 11.11% site was neutral, AI stated that 94.44% sites were found corrosive and 5.56% was found scaling and according to LS all sites was corrosive. Here a contradiction is seen in WQI and Corrosiveness index. According to water quality index, only 6 sites was found in poor water quality zone but it was observed that all sites were corrosive by corrosiveness index.

High molecular weight polyeugenol was synthesized by cationic polymerization, using $H_2SO_4$-$CH_3COOH$ catalyst, and further characterized. Furthemore, the polymers were determined to be heterotactic using 1H measurement, while the membrane produced from a combination of PVC/DOP (32:38) and DOP was liquid, with polyeugenol alone generating solid. The result of Scanning Electron Microscopy (SEM) analysis indicates a pore size of 42.3 - 127 μm in polyeugenol membrane, and also the potential for application in the filtration of yeast cells, bacteria and oil emulsions.

# Detection of Thiamine using Differential Pulse Anodic Stripping Voltammetry

Wulan Tri Wahyuni[1,2], Budi Riza Putra[*3], Ulfiatun Nisa[1], Eti Rohaeti[1]

*1 Analytical Chemistry Division, Department of Chemistry, Faculty of Mathematics and Natural Sciences, IPB Dramaga, Indonesia*

*2 Tropical Biopharmaca Research Center, Institute of Research and Community Empowerment, IPB University, Bogor 16680, Indonesia*

*3 Department of Chemistry, Faculty of Mathematics and Natural Sciences, Indonesia Defense University, Bogor, Indonesia*

*E-mail: budiriza@gmail.com*

## Abstract

Thiamine (vitamin B1) is one of the essential nutrients in human body that are useful for human brain and development of nerve system. Given the importance of thiamine for health, a quick and easy method of thiamine detection is needed. This study aimed to develop a thiamine detection method using a glassy carbon electrode (GCE) with differential pulse anodic stripping voltammetry (DPASV) technique. The developed method for thiamine detection was then applied as thiamine protocol detection in the food supplement. Determination of optimized parameters of DPASV technique for thiamine detection was carried out including pH of the electrolyte solution, deposition potential, and deposition time. Meanwhile, the analytical performance of the developed method for thiamine detection was investigated in several parameters including linearity, precision, detection limit, and quantitation limit. The optimum conditions for thiamine detection using DPASV technique were obtained at pH of 12, deposition potential of -1600 mV(vs Ag/AgCl) and a deposition time of 240 s. The analytical performance of glassy carbon electrode in thiamine detection has an R2 value of 0.994, %SBR of 4.5669%, limit of detection and quantization limit of $1.2 \times 10^{-5}$ M and $1.59 \times 10^{-5}$ M, respectively. This method can be applied for thiamine detection in vitamin B1 supplement with a percent accuracy of 95.9633% and vitamin B complex supplement with a percent accuracy of 93.3037%.

**Keywords:** *DPASV, glassy carbon electrode, supplement, thiamine, voltammetry*

# Sensitivity Enhancement of Muscle Contraction Sensors at Various Configurations on Plastic Optical Fiber

A Arifin[1*], Noviana[1], A K Lebang[1], M Yunus[1], I Idris[2], N Hamrun[3], B Armynah[1], S Dewang[1], D Tahir[1]

[1]*Physics Department, Hasanuddin University, Makassar, 90245 Indonesia*
[2]*Physiology Department, Hasanuddin University, Makassar, 90245 Indonesia*
[3]*Oral Biology Department, Hasanuddin University, Makassar, 90245 Indonesia*
*Alauddin Islamic State University of Makassar*

[*]*E-mail: arifinpide@gmail.com*

## Abstract

Research about the sensitivity enhancement of muscle activity sensors at various configurations, diameter and bends based on plastic optical fiber has been conducted. Measurement process by using various configurations methods mounted on an elastic cloth, and it affixed on the biceps and triceps muscle surfaces. LED and phototransistor connect each end of the optical fiber. Optical fiber sensors experience strain and pressure when the muscle is active by increasing the load so that the light intensity from LED propagates along the core of optical fiber becomes smaller. The phototransistor receives light intensity, and it is displayed on the computer. The best result obtained at the spiral configuration with 0 diameters using 4 bends in the biceps muscle mounting position with a sensitivity value of 0.072 V/N and resolution value of 0.013 N. The sensor has the advantages can be used to measure muscle contraction with high sensitivity, low cost, easy fabrication, easy to operate, and can be monitored via computer.

**Keywords:***muscle contraction, plastic optical fiber, sensitivity, sensor*

# Characteristics of Joints on the Saddang Fault in Tanah Toraja

Muhammad Altin Massinai[1*] , Muhammad Fawzy Ismullah Massinai[1] , Rahmat Hidayah Junior[1], Syarifullah Bundang[2]

*[1]Department of Geophysics, Hasanuddin University*
*[2]Department of Geological Engineering, Tadulako University*

*\*E-mail: altin@science.unhas.ac.id*

## Abstract

The Saddang Fault in Tanah Toraja Regency is one of the active faults in the South Sulawesi region. Determination of the direction of the Saddang fault by taking measurements in the field in the form of strike and joint dip on the fault segment in Tanah Toraja. Data processing uses the Dip software for the direction of emphasis and the Lillefors test for the accuracy of the field data. The results obtained from this study are in the form of an assertive direction leading to the Northeast - Southwest, and Northwest - Southeast. Characteristics of joint type of joint and non-systematic joint type and strikeslip fault type. This research can be used by local governments and communities in building infrastructure in Tana Toraja.

**Keywords:***Saddang Fault, Tanah Toraja, Strike and Dip, Gerus Joints, strike-slip.*

# Press Tool for the V-Bending Process of Stainless Steel Plate: Designing and Manufacturing

R. Nur[1,2] , M.A. Suyuti[1,2] , M. Iswar[1] and R. Jamaluddin[1]

[1]*Politeknik Negeri Ujung Pandang*
[2]*Center for Materials and Manufacturing, Politeknik Negeri Ujung Pandang, Jalan Perintis Kemerdekaan Km. 10 Makassar, 90245, South Sulawesi, Indonesia*

[*]*E-mail: rusdinur@poliupg.ac.id*

## Abstract

Stainless steel is a plate material that is widely used in the home and transportation industry. In bending stainless steel plates, a bending tool that has a greater compressive ability is needed. This paper was presented to design and manufacture a press tool and aims to produce a V-bending tool that can bend stainless steel sheet with a bending angle of 90o. The punch angle variation used is 80º, 85º and 90º with the die angle of 90º. While the punch radius variation is 2 mm, 4 mm, and 6 mm. The research method was carried out in several stages, starting from the literature review stage, the design stage, the manufacturing stage, and finally the tool testing stage. Based on the test results, the best punch angle and radius are close to 90º for stainless steel with a thickness of 2 mm, namely a punch angle of 90º with a punch radius of 2 mm. The press tool has a capacity that is a bending line length of 60 mm, a bending width of 44 mm, a spring height of 160 mm, a free stroke of 19.5 mm, and an acceptable spring load of 135.39 N. The capacity of the material that can be bent is stainless steel with a thickness of 1 mm and 2 mm. It can be concluded that punch radius is a significant factor affecting the loading and springback. In the air V-die free bending process, the punch radius is the most significant parameter to be considered.

**Keywords:***Die set, Press tool, V-Bending, Stainless steel.*

# X-ray Diffraction Analysis of TiO₂ Nanoparticles doped Co and Cu byWilliamson–Hall (UDM) and Size-Strain Plot (SSP)Methods

Elisabeth Clara Sampebatu[1*], Inayatul Mutmainah[1*], H. Heryanto[1*], Dahlang Tahir[1*] and Paulus Lobo Gareso[1*].

[1]*Department of Physics, Hasanuddin University, Makassar 90245 Indonesia*

*Corresponding author's:*
*elisabeth27clara@gmail.cominayatul.mutmainna@yahoo.co.idheryanto@yahoo.co.iddtahir@fmipa.unhas.ac.idpgareso109@unhas.ac.id*

## Abstract

Titanium Oxide (TiO₂) is one of the most promising candidates for high-performance of a new generation in solar cells due to its material properties such as wide band gap, high refractive index, and high dielectric constant. Doping with non-metals can improve the photocatalytic activity of the TiO₂ because they suppress the recombination of electron-holes pairs in conduction-valence bands. Transition metals (V,Fe,Ni, Co and Cu) are ideal components for doped in TiO₂ materials due to variations in the electronic structure of d-orbitals leading to visible colors. In the present study, TiO₂ nanoparticles doped with Co and Cu were synthesized by co-precipitation method. The nanoparticles were characterized by X-ray diffraction (X-RD) measurements. The crystallite size and the strain were determined using several methods such as Debye-Scherrer, Williamson–Hall (W–H), and Size-Strain (SSP) plots. Based on the X-RD results, the crystallite size decreases as Co and Cu doped increasing due to the lattice strain and the dislocation of rearrangement bonds.

**Keywords:***TiO₂, XRD AnalysisCo and Cu.*

# Structural and optical properties of AZO/TiO2 hetero-structures thin films on ITO substrates for solar cell application

P.L. Gareso[1*], Eko Juarlin[1], Paulina Taba[2], Didik Aryanto[3]

[1]*Laboratory Material and Energy Department of Physics, Faculty of Mathematics and Natural Sciences Hasanuddin University, Jl. PerintisKemerdekaan KM 10 Tamalanrea 90245 Makassar*
[2]*Department of Chemistry Faculty of Mathematics and Natural Sciences, Hasanuddin University, Jl. PerintisKemerdekaan KM 10 Tamalanrea 90245, Makassar*
[3]*Reserach Center for Physics, Indonesian of Science Institution (LIPI), Kawasan PuspitekSerpong Building 440-442, Tagerang Selatan 15314*

[*]*Corresponding author's e-mail address: pgareso109@unhas.ac.id didik.aryanto@lipi.go.id*

## Abstract

The material properties of AZO/TiO$_2$ hetero-structures grown on ITO substrate with different aluminium concentration have been studied using X-ray diffraction (X-RD) and UV-Vis spectroscopy measurement. AZO precursor was prepared by dissolving zinc acetate dehydrates into an ethanol. The solutions were added with triethanolamine and aluminum chloride as a stabilizer and a dopant, respectively. The TiO$_2$ precursor was prepared by TiO$_2$ Nano-powders that were dissolved into a solvent of ethanol and it becomes sol-gel. The layer AZO film was first deposited and then followed by TiO$_2$ on ITO substrates. The AZO/TiO$_2$ hetero-structures were put into furnace for undertaking the heat thermal at the temperatures of 5000C for 60 minutes. X-RD was used to characterize the structural properties of AZO/TiO$_2$ hetero-structures. Based on the X-RD results, the peak are clearly observed for ZnO thin films in the plane of (100), (103), (110) and (103), while TiO2 diffraction peaks was seen at the plane of (110) indicating that TiO$_2$ is anatase phase. The UV-Vis spectrophotometer was used to characterize the optical properties of the hetero-structures in the wavelength range of 300 to 800 nm. The band gap energy of AZO/TiO2 is estimated of 3.62 eV for the aluminium concentration of 4%

**Keywords:***Anatase phase, AZO/TiO$_2$ hetero-structures, Thin films.*

# Smart Trash Bin Design: Automatic Garbage Sorter Based on Capacitive Proximity Sensor and Object Recognition

Sri Fatimah Az Zahra[1*], Muqoil Darussalam[1], Muhammad Umar[2], A. Arifin[1]

*[1]Department of Physics, Hasanuddin University*
*[2]Department of Electrical Engineering, Hasanuddin University*

*\*Email: srifatimahazzahra@gmail.com*

## Abstract

Garbage is one of the causes of environmental pollution due to lack of awareness of disposing of waste in its place. Garbage bins are generally classified based on the type of organic, inorganic and metallic waste. However, the trash can is still manual and its implementation is still not optimal because the knowledge and awareness of the community is still lacking to be able to dispose of waste according to the type of waste. Based on these problems, the purpose of this research is to design and create a smart trash bin that can sort organic, inorganic and metal waste automatically. The method of this research is to design, create and test a prototype of a smart trash bin with object recognition. This smart trash can utilizes capacitive and inductive proximity sensors to detect the type of waste and uses a conveyor that directs waste to the appropriate place for its type. This tool uses an Arduino microcontroller as a prototype controller. After the sensor detects the type of waste, the conveyor will stop moving for a few seconds and the garbage will be pushed into the trash according to the type of waste. The results showed that this tool can work well, namely it can sort out organic, inorganic and metal waste automatically. The advantage of this smart trash bin system is that it uses a better object recognition method to increase accuracy in sorting waste types and the use of solar panels as a power source.

**Keywords:***Trash, sensor, smart trash, capacitive, inductive.*

# An Ethnomedicinal study of Medicinal Plants Used against Gastrointestinal Complaints By "Kaili Ledo Ethnic" in Central Sulawesi, Indonesia

Ramadanil Pitopang[1*], Yan Pratama[2], Yusran[3], Puti Andalusia SG Banilai [4]

[1]*Department of Biology, Faculty of Mathemathics & Natural Sciences, Tadulako University, Jl. Sukarno Hatta Km 9,Kampus Bumi Tadulako, Tondo Palu, Indonesia, Post Code : 94117*
[2]*Post Graduate Program Tadulako University, Jl. Sukarno Hatta Km 9, Kampus Bumi Tadulako,Tondo Palu, Indonesia,Post Code : 94117*
[3]*Department of Forest Management, Faculty of Forestry Tadulako University, Jl. Sukarno Hatta Km 9, Kampus BumiTadulako, Tondo Palu, Indonesia, Post Code : 94117*
[4]*Department of Public Health, Faculty of Public Health, Tadulako University. TadulakoUniversity, Jl. Sukarno Hatta Km9, Kampus Bumi Tadulako, Tondo Palu, Indonesia, Post Code :94117*

[*]*E-mail*: pitopang_64@yahoo.com

## Abstract

The research entitled "An ethnomedicinal study of medicinal plants used against gastrointestinal complaints by Kaili Ledo Ethnic in central Sulawesi, Indonesia was undertaken from May 2019 to March 2020. The research site was located in Raranggonau, an oldest subvillage of Kailinese Ledo aimed to conserve the ethnomedicinal knowledge of Kaili Ledo ethnic in using plants for healing gastrointestinal complaints and to select candidate medicinal plants for further phytochemical and pharmacological investigation. The data indigenous knowledge of medicinal plant has been collected by using in-depth interview with prior informed consent using an open-ended questionaire. A snowball technique was performed to obtain a appropriate respondents. Descriptive statistical method was employed to analyse and summarize the ethnobotanical data on the reported medicinal plants and associated knowledge. The result showed that there were 25 species belonging to 16 families were found to be used against gastrointestinal complaints in the studied area. Most dominant family used against gastrointestinal complaints was Lamiaceae (3 species), followed by Poaceae, Fabaceae, Euphorbiaceae and Asteraceae (2 species each). Solanaceae, Asparaginaceae, Araucariaceae, Rosaceae, Rubiaceae, Musaceae, Melastomataceae, Caricaceae, Basellaceae and Balsaminaceae (1 each).

**Keywords:***gastrointestinal, kaili ledo, medicinal plant, central sulawesi*

# ANTIBACTERIAL PROPERTIES OF COMPOSITE POLIEUGENOL/ZnO MATERIAL

Erwin Abdul Rahim[1*], Muh. Afrizal Apok[1], Abdul Rahman Razak[1], Ni Ketut Sumarni[1], Ahmad Ridhay[1]

[1]*Department of Chemistry, Tadulako University, Jl. Sukarno-Hatta Km 9, Palu 94148, Central Sulawesi, Indonesia*

[*]*Corresponding author, email: erwin_abdulrahim@yahoo.com*

## Abstract

Research about the manufacture of polyeugenol/ZnO composite materials was carried out with ratios: 100:0 75:25 50:50 25:75 and 0:100 (w/w; mg/mg). Polyeugenol was synthesized from eugenol compound using H2SO4-CH3COOH catalyst. The addition of ZnO could show much stronger antibacterial properties compared to polyeugenol. The purpose of this study was to determine the ratio of the polyeugenol/ZnO composite material which has the strongest antibacterial activity against Escherichia coli and Staphylococcus aureus bacteria. The method of determining antibacterial properties was the well diffusion method by observing the diameter of the inhibition zone. The data obtained were analyzed through variance method (ANOVA) and post-hoc test of Duncan. The comparison that showed the largest inhibition zone diameter, which was 19.76 mm for Staphylococcus aureus and 20.29 mm for Escherichia coli, was polyeugenol 75 mg: ZnO 25 mg.

**Keywords:***Polyeugenol, ZnO, Antibacterial, Escherichia coli, Staphylococcus aureus.*

# Application Of Fuzzy Time Series To Forecast COVID-19 Cases In Central Sulawesi

Nurul Fiskia Gamayanti[1], Junaidi[2], Fadhilah Fitri[3]

[12]*Department of Statistics, Faculty of Mathematics and Natural Science (FMIPA), Tadulako University, IndonesiaJl. Soekarno Hatta Km 9, Palu, Sulawesi Tengah, 94118, Indonesia*
[3]*Department of Statistics, Faculty of Mathematics and Natural Science (FMIPA), Universitas Negeri Padang, IndonesiaJln. Prof Dr Hamka Air Tawar Padang, 25131, Indonesia*

[*]*E-mail*: *nurulfiskia@gmail.com*

## Abstract

Forecasting is a method used to predict the value of a variable in a future time. One of the forecasting methods that can be used for this aim is with fuzzy time series approach. Fuzzy time series is a forecasting method used to predict historical data by forming linguistic values and producing more accurate forecasts. This paper is describes the fuzzy time series to predict the positive case of covid 19 in Central Sulawesi. Forecasting steps in fuzzy time series are define the universe U, determine the number and length of interval classes, defuzzify and define sets Fuzzy on U, perform Fuzzification on data number of visitors, determine Fuzzy logical relationship (FLR), forming Fuzzy Logical Relationship Group (FLRG), perform defuzzification, and perform forecast calculations. The forecasting results with an accuracy of forecasting value using MAPE of 36.90 so the results of forecasting positive cases of COVID-19 in Central Sulawesi using fuzzy time series are enough. This COVID-19 case can also change at any time depending on the efforts of the Central Sulawesi government and public awareness to always maintain cleanliness and also implement the health protocols that have been set to reduce the chain of virus spread.

**Keywords:**c*ovid 19, fuzzy time series, central sulawesi*

# THE EFFECT OF ADDITIONAL CO-DOPING COBALT (Co), NICKEL (Ni) ON THE MATERIAL PROPERTIES OF ZINC OXIDE (ZnO) NANOPARTICLES

Fitriah Mujtahid[1*], Paulus Lobo Gareso[1*], Dahlang Tahir[1*], Inayatul Mutmainna[1*]

*Department of Physics, Faculty of Mathematics and Natural Sciences, Hasanuddin University, JL. PerintisKemerdekaan KM.10, Tamalanrea Makassar 90245*

*Corresponding author:*
*mujtahidfitriah@gmail.compgareso@fmipa.unahs.ac.iddtahir@fmipa.unhas.ac.idinayatul.mutmainna@yahoo.co.id*

## Abstract

Research on ZnO nanoparticles has attracted attention because of the unique optical properties of crystal size and morphology. However, the bandgap of ZnO is large enough to limit its application. To overcome this, the addition of doping metal ions Cobalt (Co) and Nickel (Ni). The effect of the addition of Co and Ni was observed on the characteristics of the material properties of Zinc Oxide (ZnO) nanoparticles. Various percentages of doping were prepared by coprecipitation method. The effect of the addition of Co and Ni doping on ZnO was analyzed using FTIR and XRD. The FTIR results show a Zn-O strain vibration that confirms the formation of ZnO compounds and there is a change in a peak that interprets the formation of ZnO codoping Co, Ni bonds. From the XRD analysis, it was confirmed that there were no additional impurity peaks in ZnO nanoparticles. Co and Ni doping affect the Zn lattice structure. The crystal size was analyzed using the Debye-Scherrer and Williamson–Hall (UDM) method, the obtained crystal sizes varied depending on the concentration of Co and Ni. The analysis results obtained are suitable for further research as a photocatalyst.

**Keywords:** *ZnO, co-doping Co-Ni, X-Ray, FTIR*

# Polyphenol in sappan wood (Caesalpinia sappan L.) extract results of ultrasonic assisted solvent extraction

Andi Muhamad Iqbal Akbar Asfar[1*], Andi Muhammad Irfan Taufan Asfar[2]

[1]*Department of Chemical Engineering, Politeknik Negeri Ujung Pandang, 90245, South Sulawesi, Indonesia*

[2]*Department of Mathematics Education, Universitas Muhammadiyah Bone, 92713, South Sulawesi, Indonesia*

*\*E-mail: andiifalasfar@gmail.com*

## Abstract

Sappan wood or also known as Sepang is a shrub that has been used as a traditional medicine from generation to generation, especially in Southern Bone Regency. Sappan wood herb contains several chemical compounds such as tannins, flavonoids, and polyphenols. This study aims to analyze the levels of polyphenols in Sappan wood extract from Bone Regency, South Sulawesi Province through extraction using Ultrasonic Assisted Solvent Extraction (ultrasonic extraction) with water as solvent. The method used was the visible spectrophotometer of Follin-Ciocalteu gluing with pH variations of 6, 7, and 8 with the results of Sappan wood polyphenol content at three pH conditions were 34.33% (pH 6), 13.70% (pH 7), and 12.66% (pH 8). The results of this analysis indicate that the largest polyphenol content is at pH 6, that the greater the pH, the lower the polyphenol content.

**Keywords:***sappan wood, ultrasonic, polyphenol*

# Cost-effectiveness analysis on a typhoid model with intervention of vaccination, treatment, and healthy life campaign

Prima Rakhmawati[2]), Bevina D. Handari[1]), Gebrina Risky[3]), Dipo Aldila[4])

*[1234]Department of Mathematics, University of Indonesia, Depok 16424*
*Corresponding author's:*
*bevina@sci.ui.ac.idprima.rakhmawati@sci.ui.ac.idgebrina.risky@sci.ui.ac.idaldiladipo@sci.ui.ac.id*

## Abstract

Typhoid fever is an illness caused by Salmonella typhi and spread through unhygienic water (fecal-oral route). In this talk, we will discuss an optimal control model on the spread of typhoid fever with a time-dependent vaccination, medical treatment, and healthy life campaign. The existence of the optimal control solution is analyzed using the well-known Pontryagin's Maximum Principle. Numerical simulations were conducted for seven different scenarios based on the combination of interventions that will be used. Cost-effectiveness analysis is used to determine the best strategy to conduct the spread of typhoid fever among the population. We find that a combination between vaccination and a healthy life campaign is the best strategy to reduce the number of new infections. On the other hand, combination between vaccination, treatment, and a healthy life campaign is the best strategy from a low-cost intervention perspective.

**Keywords:***Typhoid fever, Optimal control problem, Pontryagin's maximum principle, Cost-effectiveness analysis*

# THE APPLICATION OF INDICATOR KRIGING (IK) ON INTERPOLATION THE CONTENT OF LATERITE NICKEL MINES AT PT. RAIHAN CATUR PUTRA

NurfitrianiMaulida Suaib[1*], Nur'eni[1], Iman Setiawan[1], and Jamidun[2]

*[1]Statistics Studies Program, Tadulako University (Untad), Indonesia*

*[2]Geophysical Engineering Studies Program, Tadulako University (Untad), Indonesia*

*[*]E-mail: maulidatuan@gmail.com*

## Abstract

This research analysis how to interpolation the benefical content of laterite nickel mining in production at PT. Raihan Catur Putra. The data used in the research are 51 coordinates of the mining business license of PT. Raihan Catur Putra, Morowali regency in 2018. The answer this question, first get a threshold value. Second, coding data based on threshold values. Third, calculate the experimental semivariogram values. After that, calculate the theoretical semivariogram values and then choose the best model of the theoretical semivariogram based on the smallest MSE value. The last step, interpolation the content of laterite nickel based on the best model and plot of the predicted area. The result showed, the best model is the spherical with an MSE value of 0,5055551. One of the profitable laterite nickel mines in production at PT. Raihan Catur Putra is at 2,962945 ; 122,1932 with an opprtunity value of 0,99. In the interpolation plot, the favorable area has an orange degradation whose distribution conditions are almost comprehensive.

**Keywords:***indicator kriging, laterite nickel, spherical model*

# CLUSTERING QUALITY BAWANG MERAH PALU (ALLIUMASCALONIUM L.) USING KOHONEN ALGORITHM

Selvy Musdalifah[1*], Agusman Sahari[1], Desy Lusiyanti[1]

[1]*Mathematics Study Program of Science Faculty, Tadulako University, Indonesia*

[*]*E-mail:selvymusdalifah@gmail.com*

## Abstract

Bawang Merah Palu (Allium Ascalonium L.) is one of multipurpose bulb vegetables that has high economic value. In Central Sulawesi, there is a typical of union called "Bawang Merah Palu", however not all Bawang Merah Palu has the same quality. As a result technique should be used to obtain a classification based on its quality.The purpose of this research is to get the clustering of quality Bawang Merah Palu using kohonen algorithm. The clustering process is done using 48 data. The attributes of this study are aging, hardness, rotten, damage, water content and diameter.The results obtained by devided into 2 clusters which are first cluster consists of 6 data and the second cluster consists of 42 data with the parameters that influence is hardness. Based on the result of this research, its found that the first cluster doesn't meet the quality standard and the second cluster meets the quality requirement II according to SNI 01-3159-1992, and its also found that Bawang Merah Palu in Sidondo village, oloboju village, and soulowe village has good quality.

**Keywords:**Bawang Merah Palu, Clustering, Kohonen Algorithm.

# Synthesis of Edible Film From Agar of Seaweed (Gracillaria sp.) Using Glycerol as Plasticizer With Addition of Carboxymethyl Cellulose (CMC)

Ni Ketut Sumarni[1*], Jaya Hardi[1], Annisa Setyaningrum[1]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Science, UNTAD, Palu, Indonesia*

*E-mail: : niketutsumarni@untad.ac.id*

## Abstract

The research about synthesis of edible film from agar of Seaweed (Gracillaria sp.) using glycerol as plasticizer with addition of Carboxymethyl cellulose (CMC) had been done. The research aims to identify the physico-chemical properties of edible film based on the used glycerol as plasticizer and CMC as additional materials. This research used a completely randomized design (CRD) with two variables namely glycerol concentration and CMC concentration (30, 35, 40, 45, 50% (w/w) and 0, 30, 50, 70, 100% (w/w) respectively). Edible film thickness was tested using a micrometer while for tensile strength and elongation were tested with a Universal Testing Machine. The best glycerol concentration was obtained at 45% glycerol concentration with 0.0167 mm of thickness, 57.18 g/24 hours .m2 of water vapor transmission rate, 14.23 MPa of tensile strength, and 12.75% of elongation. Those results were used for edible film formulation with the addition of CMC. The best concentration of CMC was obtained at 30% CMC concentration. It has thickness 0.0189 mm of thickness, 48.18 g/24 hours .m2 of water vapor transmission rate, 12.47 MPa, of tensile strength, and 66% of elongation.

**Keywords:** *Agar, gracillia sp., Glycerol, CMC, edible film.*

# Grouping of Districts/Cities in Central Sulawesi Province Based on NaturalDisasters Using Fuzzy Subtractive Clustering

Irdayanti[1*], Junaidi[1],Iman Setiawan[1], Fadjryani[1]

*[1]Statistics Department, Tadulako University, Palu, Indonesia*

*Corresponding author's:*
*irdayanti1918@gmail.comsutan_jun@yahoo.co.uki.setiawan@untad.ac.idolahdata.palu@gmail.com*

## Abstract

Natural disasters are a wide range of damage due to natural phenomena that hazardous events interacting human population. Central Sulawesi is one of the provinces in Indonesia which has the high risk of disasters. This research aims to cluster districts/cities in Central Sulawesi based on natural disasters. This research uses the fuzzy subtractive clustering method with the data used is the number of villages/wards by the type of natural disaster happened in 2015-2017. In determining the best number of cluster in this research we apply the value of the cluster variance. The results showed that the best number of clusters in this problem is three clusters. The first cluster consists of six districts/cities and is classified as an area with a low intensity of natural disasters, the second cluster has five districts/cities and is classified as an area with moderate natural disasters intensity and the third cluster has two districts/cities and is classified as an area that has an intensity high incidence of natural disasters.

**Keywords:***Natural Disasters, Clustering, Fuzzy Subtractive Clustering*

# Web-Based Decision Supporting System in Determining the Right Strategy for Small and Medium Enterprises Local Fried Onions in Palu to Survive in the COVID-19 Situation

Fadjriyani [1*], Junaidi[1],Agi Aprila[1]

[1]*University of Tadulako*

*E-mail:sutan_jun@yahoo.co.uk*

## Abstract

The Covid-19 pandemic has paralyzed almost all business sectors in Indonesia. This also has an impact on the small and medium enterprises (SME) local fried onions in Palu City, Central Sulawesi. The decline in turnover that they earned has caused a lot of business actors have to close their businesses and lay off their employees. For this reason, a strategy is needed that can be taken in helping to protect their businesses. As a result, they can survive during this pandemic. Through a decision support system, it is hoped that it will help the SME actors in determining strategic priorities that are able to boost their economy. Moreover, it provides an alternative in making better decisions. The method used in having this strategy decision is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). This method is the best chosen alternative, not only by having the shortest distance from the ideal positive solution but also by having the longest distance from the ideal negative solution. The positive ideal solution is defined as a solution that maximizes the benefit attributes while the negative ideal solution is defined as a solution that minimizes the benefit attributes and maximizes the costs. The results showed that the right strategy that can boost the SME local fried onions in Palu in order to improve their economy is prioritized on the use of electronic markets (e-commerce), the continuity of raw materials availability, the attractive packaging design and the providing delivery services. Based on these results, it can be predicted that Palu's local fried onion actors who can still survive in the midst of the Covid-19 pandemic are the Bawang

Goreng Mbo Sri at first ranked with the highest preference value of 0.6292 then followed by the Bawang Goreng Mutiara with the preference value of 0.5665. The prediction is obtained due to the implementation of the selected priority strategy that conducted by them. The information as in the form of a strategy is then implemented in a database system using the MySQL programming language. The development of a database with MySQL serves to load a variety of large information and is applied via a web interface. In consequence, it can make easier for users (Palu's local fried onion actors) to access data which are in the form of strings (text). The data can also be accessed both privately and publicly on the web.

# The effect of Arginine addition in the diets of laying hens on characteristics and quality of eggs stored for 14 days

U. Hatta[1*], S. Sarjuni[1], S. Mozin[1], N. M. Toana[1], B. Sundu[1]

[1]*Animal Husbandry Department, Universitas Tadulako, Palu, Sulawesi Tengah, Indonesia.*

[*]*Corresponding author: Ummianihatta71@gmail.com*

## Abstract

Arginine has been believed to have a positive effect on chicken production when the birds were raised in tropical regions. A research was carried out to determine the effect of arginine on the characteristics and quality of eggs stored for 14 days at ambient temperature. A total of 120 laying hens, aged 22 weeks old, were used in this study. The hens were kept for two months in individual battery pens. The hens were fed with five different experimental diets. The treatment diets were basal diet (T-1), basal diet + 0.1% arginine (T-2), basal diet + 0.2% arginine (T-3), basal diet +0.3% arginine (T-4) and basal diet + 0.4% arginine (T-5). The diets and drinking water were present at all times. Variables measured were egg shape index, eggshell thickness, yolk characteristics, albumin height, the Haugh unit, and egg mass loss. The study used a completely randomized design with 5 different treatment diets, 6 replications of hens each. Data were analyzed using analysis of variance and differences among the means detected by variance analysis were further test by using the Tukey test. Results of the study indicate that treatments produced no significant effects on egg shape index, yolk, albumin and eggshell percentages, yolk height, yolk index, and yolk color. The addition of arginine in the diets could slow down egg mass loss when the eggs were stored for 14 days at room temperature. The Haugh unit and albumen height were better in eggs produced by the hens fed the arginine-supplemented diets. The hens fed the diets containing arginine

produced thicker eggshells than those eggs produced by diets without arginine supplementation. In conclusion, the addition of arginine in the diets increased the quality of eggs when the eggs were stored for 14 days at room temperature. Shell thickness was better in the eggs produced by hens fed the arginine-supplemented diets than those eggs from hens fed without arginine supplementation.

**Keywords:***Arginine, Egg characteristics, Egg quality, Laying hens, tropical regions*

# Reproductive response of cross-bred between local male chickenand commercial laying hens fed selenium-added diets

B. Sundu[1*], A. Adjis[1], U. Hatta[1], S. Sarjuni[1]

*[1]Animal Husbandry Department, Universitas Tadulako, Palu, Sulawesi Tengah, Indonesia.*

*[*]Corresponding author: b_sundu@yahoo.com*

## Abstract

Selenium has been believed to be a race mineral that can affect sperm quality. A study was done to determine the effect of selenium on semen quality, concentration and motility of spermatozoa, fertility, and hatchability of cross-bred local male chicken and commercial laying hen of Lohman strain. A total of 25 local male chickens and 100 laying hens, aged 50 weeks old, were used in this study. The hens were kept for four months and fed experimental diets. The treatment diets were control basal diet (R-1), basal diet + 0.5% fermented coconut dregs without sodium selenite addition (R-2), basal diet + 0.5% fermented coconut dregs with 0.2% sodium selenite addition (R-3), basal diet + 1.0% fermented coconut dregs without sodium selenite addition (R-4) and basal diet + 1.0% fermented coconut dregs with 0.2% sodium selenite addition (R-5). The experimental design used was a completely randomized design with 5 treatment diets and five replications. Data were analyzed using analysis of variance and any differences detected by the analysis were further tested by the Tukey test. The results of the study indicate that the macroscopic quality of the semen was relatively similar. Selenium addition in the chicken diets affected motility and concentration of spermatozoa. Fertility of spermatozoa and hatchability were also positively affected by the addition of selenium in the diets. In conclusion, the addition of selenium in the chicken diets improved the spermatozoa quality, fertility and hatchability.

**Keywords:***Chicken, fertility, hatchability, selenium, spermatozoa*

# Ground Penetrating Radar Application for Identification of Subsurface Deformation and Fractures at Tadulako UniversityCampus Palu

Rustan Efendi[1], Erfan Syamsuddin[2] , Sandra[1], Alimuddin Assegaf[2], Abd Rahman[1]

[1]*Program Studi Teknik Geofisika Universitas Tadulako Jl Sukarno Hatta Km 9 Palu*

[2]*Program StudiGeofisika Universitas Hasanuddin Jl. PerintisKemerdekaan km 10 Makassar*

[*]*E-mail:rstefendi67@gmail.com*

## Abstract

The Ground Penetrating Radar (GPR) survey was carried out after the 7.4 Mw earthquake in the Tadulako University Campus area, Palu, Central Sulawesi. The purpose of this study was to map the subsurface structure of the Auditorium building. In this survey, an antenna with a frequency of 160 MHz was used on several tracks located on the outside and inside of the Auditorium Building. The results showed that the shape of the subsurface rock structure had undergone deformation and fracture. Deformation and fracture occurred at a depth of 1 m to 10 m due to the 7.4 Mw earthquake and this caused damage to the Tadulako University Audorium Building.

**Keywords:***gpr, fracture, deformation, earthquake*

# Analysis of the changes power output and irradiation dose laser on OD and MDA values from photoinactivation treatment against Candida albicans and Staphyloccocus epidermidis biofilms with green lasers

Muhammad Zain[1], Sri Dewi Astuty[2*], Syamsir Dewang[2], Sri Suryani[3], BidayatulArmynah[4], Syahrul Ramadhana[1], and Enggrianti Engrianti[1]

[1]*Student of Physics Department, Mathematics and Science Faculty, HasanuddinUniversity.*

[2]*Optic and Spectroscopy Laboratory, Physics Department of FMIPA, HasanuddinUniversity.*

[3]*Material and Energy Laboratory, Physics Department of FMIPA, HasanuddinUniversity.*

[4]*Electronics and Instrumentation Laboratory, Physics Department of FMIPA,Hasanuddin University.*

[*]*E-mail:dewiastuti@fmipa.unhas.ac.id*

## Abstract

The successful of PDT mechanisms to killing the pathogenic microbe as Candida albicans and Staphyloccocus epidermidis many have research in vitro using natural photosensitizer like chlorophyll. Both of kind microbe knew trigger infectious diseases, especially in canker sores and wounds, very difficult to eradicate by antibiotic agents. The working principle of the photoinactivation mechanism utilizes the activation process of sensitizer molecules by light so that an excitation process occurs and the formation of reactive compounds such as singlet oxygen. The activation process involves the absorption of a number of the photon energy of light which is called the radiation energy dose which depends on the power output of the light source over a certain period of time. This study aims to compare the effect of photoinactivation on the biofilm associate between C. albicans and S. epidermidis with exposure variations between 60 to 300 seconds. There are two hypotheses to be used in this researches, if the number of cells samples culture is lower and if the value of malondialdehyde is higher so that the effectiveness is called

optimum. The light instrument had been designed to use a microcontroller with a green laser completed of the display unit of output power. The results showed that the OD values for the negative control (P-) and positive control (P+) groups on the oxygenated biofilm were (1,241±0,175) and (0,579±0,108), respectively. After PDT treatment with green laser was able to reduce biofilm cells up to 42 % (D5 group) and 66% (PD5 group). The results of the MDA test showed that the highest value in the PD5 group was (0.388±0.004) nmol/mL. This indicates that the combination of two types of microbes that form a biofilm will have a different inactivation effect compared to single biofilm cells

# The analysis of potency of Jarak leaf Extract (Jatropha Curcas L.) after radiating with red laser to inhibiting the growth of oxygenated *Staphylococcus epidermidis* Biofilm cells

Enggrianti Engrianti[1], Sri Dewi Astuty[2*], Bidayatul Armynah[3], Sri Suryani[4] ,Syahrul Ramadhan[1], and Muhammad Zain[1]

[1]*Student of Physics Department, Mathematics and Science Faculty, Hasanuddin, University.*

[2]*Optic and Spectroscopy Laboratory, Physics Department of FMIPA, Hasanuddin, University.*

[3]*Electronics and Instrumentation Laboratory, Physics Department of FMIPA,HasanuddinUniversity*

[4]*Material and Energy Laboratory, Physics Department of FMIPA, Hasanuddin, University.*
[*]*Email : .dewiastuty@fmipa.unhas.ac.id*

## Abstract

Photoinactivity known as antimicrobial photodynamic therapy (aPDT) is part of the photodynamic therapy (PDT) system which is intended to inhibit the growth of pathogenic microbes that trigger infectious diseases in the human body. Photoinactivation developed in research has used natural photosensitizer agents extracted from plants that contain antimicrobial substances. Photoinactivation utilizes the interaction of light with photosensitizers and oxygen which produces free radical products or reactive compounds called reactive oxygen species (ROS). This study aims to determine the optimal performance of Jarak leaf extract (Jatropha curcas L.) through irradiation with a red laser to kill Staphylococcus epidermidis biofilm cells whose oxygen level has been increased previously. The analytical method used is XTT (2,3-Bis-(2-Methoxy-4-Nitro-5-Sulfophenyl)-2H-Tetrazolium-5-Carboxanilide) staining assay with the optical density value (l=490 nm) as an indicator of the number of cells still active metabolize. The results obtained showed that the data for control group (P-) unoxygenated biofilms and

oxygenated biofilms respectively of (2.119±0.153) and (1.644±0.138), established a decrease after 10 minutes of irradiation of (0.926±0.220) for unoxygenated biofilms and (0.828±0.139) for oxygenated biofilms. This shows that the effectiveness of Jarak leaf extract (Jatropha curcas L.) after being activated by a high-potential red laser inhibits the growth of Staphylococcus epidermidis biofilm cells

# SYNTHESIS OF HYDROXYPATITE FROM DUCK EGG SHELLS WITH PRECIPITATION METHOD FOR BIOKERAMICS APPLICATIONS

MutmainnahJusman[1], Nurlaela Rauf[1*], Sri SuryaniSumah[1]

*[1]Hasanuddin University.*

*[*]E-mail: n-rauf@fmipa.unhas.ac.id*

## Abstract

The increasing cases of fractures and tooth decay have an impact on the increased demand for bioceramics, such as hydroxyapatite (HAp). Research has been carried out using duck egg shells as a source of calcium for the synthesis of HAp using the precipitation method. This study aims to determine the chemical components of duck egg shells before and after calcination, and to analyze the effect of variations in sintering temperature on HAp. Characterization was carried out using XRF and XRD as well as testing the mass efficiency of hydroxyapatite at sintering temperatures of 700oC, 800oC, 900oC, and 1000oC for 5 hours. The results of XRF analysis showed that the main component contained in duck egg shells before calcination was calcium (Ca) of 99.35% and after being calcined at 800°C for 3 hours produced calcium oxide (CaO) of 93.95%, and components HAp mainly contains CaO and P2O5. The results of XRD analysis showed that the phase formed was HAp with a hexagonal crystal structure. HAp which was sintered at 700oC, 800oC, 900oC, and 1000oC for 5 hours resulted in a crystal size of 14,181 nm, respectively; 20,871 nm; 30,5598 nm and 31,7327 nm with hydroxyapatite mass efficiency, 61,77%; 58,84%; 58,62%; and 57,47%. Based on the results of characterization and testing that sintering at a temperature of 800oC is the optimum condition for HAp to be applied as bone and dental implants.

**Keywords:***duck egg shell, hydroxyapatite, sintering*

# Effect of Magnetic Field Exposure from Helmholtz Coils on Bidara Plant Germination

AnisNismayanti[1*], Ervinawati[1], Hosiana MdLabania[1], Lufsyi Mahmudin[1], Abd Rahman[1], SittiRugayya[1], IchaUntari Meidji[1]

*[1]Tadulako University*

*[*]E-mail:anisfisits@gmail.com*

## Abstract

Bidara (Ziziphus mauritiana) is a herbaceous plant and generally grows in dry area. However, this plant is still a plant that is not easy to find in Indonesia, because not too many are cultivating it. The cultivation process using a magnetic field accelerates the germination process. So this research was conducted to determine the effect of exposure to magnetic fields on the germination of bidara plants. This study uses variation of magnetic field exposure are 0.03 mT, 0.06 mT, and 0.09 mT, and time variations are 10 minutes/day, 20 minutes/day and 30 minutes/day for 7 days. The magnetic field presented is generated from a Helmholtz coil with a diameter of 19.8 cm and 400 turns in each coil with a current variation of 0.16 A, 0.27 A and 0.38 A which is measured using a Gaussmeter. The study used 10 samples of bidara seeds with 1 sample as a control (not exposed to a magnetic field) and 9 samples exposed to a magnetic field. Based on the data obtained, it was proved that the magnetic field value and the duration of exposure had an effect on the growth and length of the sprouts of the bidara plant. The most optimum magnetic field value and duration of exposure were 0.06 mT with a time of 20 minutes/day

**Keywords:***Bidara, Magnetic Field, Helmholtz Coil, Germination*

# The propagation pattern of the tidal constituents based on the tide height in Tomini Bay, Central Sulawesi Province.

Sabhan[1*], Hosiana MD. Labania[1], Riski Wahyu Efendi[1], Yutdam Mudin[1], Abd. Rahman[1]

[1]*Department of Physics, Faculty of Natural Science and Mathematics, Tadulako University*

[*]*E-mail: sbh_ikl@yahoo.com*

## Abstract

Research has been carried out to see the pattern of tidal propagation of K1 and M2 components, which are the dominant daily and semi-daily components in Tomini Bay. The tidal propagation pattern is obtained by analyzing the tidal data predicted by the Geospatial Information Agency (BIG). The analysis was carried out using the Root mean square error method to analyze the tidal harmonic components with an hourly data range for one month. The analysis results show that the tides in Tomini Bay propagate westward from the Maluku Sea in the eastern part of Tomini Bay into Tomini Bay. The M2 component in Tomini Bay ranges from 0.18-0.20 m with a higher amplitude on the northern and southern coasts of Tomini Bay, while the K1 component is in the 0.14-0.16 m amplitude range with a pattern similar to the M2 component. Tidal propagation both k1 and M2 experienced a slowdown on the north and south sides of the bay due to friction with the water bottom near the coast. Tidal propagation in the northern part is hampered by the friction of the shallow seabed, while in the southern part, there is a group of Togean Islands.

**Keywords:** *Tidal Propagation, Mean square error, Tomini Bay.*

# The Effect of pH and Incubation Temperature on The Activity of Bromelain Pineapple Hump (Ananas comosus) Amobilized SeaSand

Nurhaeni[1*], Syeli Adhalina[1], Syamsudin[1], Prismawiryanti[1]

[1]*Department of Chemistry, Faculty of Natural Science and Mathematics, TadulakoUniversity*

*[*]E-mail: eni_kimia64@yahoo.co.id*

## Abstract

A research was done to determine the effect of pH and incubation temperature on the bromelain activity of immobilized pineapple (Ananas comosus) in sea sand. Isolation of bromelain enzyme was done using ammonium sulfate precipitation method. Bromelain enzyme immobilization was carried out by the adsorption method using sea sand as the immobilization matrix. Protein contain test with Bradford method. Each stage is done three times repetition and analyzed spectrofotometry. Base on the result, optimum pH of bromelain enzyme immobilized on sea sand is 6.0 with activity 1.66 unit/g and optimum temperature of bromelain enzyme imobilized on sea sand is 50°C with activity 3.24 unit/g.

**Keywords:** *enzyme, immobilized, bromelain, pineapple, sea sand.*

# The Effect of Light Intensity and Heating Chlorophyll Extract Ipomea reptans Poir as a Sensitizer

Iqbal[1*], Muhammad Basir[2*], Darmawati Darwis[1*]

*[1]Jurusan Fisika FMIPA Universitas Tadulako*

*[2]Jurusan Ilmu Tanah F. Pertanian Universitas Tadulako*

*[*]Corresponding author:*
*Iqbal01okt@gmail.combasircyio@yahoo.comdarmadarwis@yahoo.com*

## Abstract

Research has been carried out on the effect of light intensity and heating on extract Ipomea reptans Poir as a sensitizer. Water spinach extract was extracted by maceration with a solvent ratio of 1:2. The absorbance was measured at a wavelength of 400 – 700 nm using a UV-vis spectrometer with a dilution of 25 x. Calculation of chlorophyll a, chlorophyll b and total chlorophyll in kale extract grown in a greenhouse and outside in an open environment. Water spinach extrac was heated to test the stability of the extract due to heating at temperatures of degrees celcius 32, 40, 50, 60, 70, 80, 90 and 100. The results showed that water spinach plants in the greenhouse had better chlorophyll extract quality than those in the open environment. Chlorophyll in the greenhouse a=403.95 g/l, b=151.72 and total = 555.00 mg/l. Chlorophyll outside the greenhouse a=152.45 mg/l, b=22.80 and total = 175.6 mg/l. The sensitizer material of Ipomea Reptans Poir is unstable at high temperatures starting from 80 0C, it is observed that there is a decrease in the absorbance value.

**Keywords:**_Chlorophyll extract, Sensitizer, maceration, absorbance.._

# Electrochemical Performance of Graphene Paste Electrode Modified TiO₂-Calix[4]Arene (G@TC) as a Cd²⁺ Ion Detection

N Dali[1], M Maulidiyah[1], D Deriatman[1], Z Arham[2], L O A Salim[1],I Irwan[1], F Mustapa[3],

MNurdin[1*]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*
[2]*Department of Mathematics and Natural Science, Institut Agama Islam Negeri (IAIN), Kendari 93116, Southeast Sulawesi, Indonesia*
[3]*Department of Aquaqulture, Faculty of Sciences and Technology, InstitutTeknologi dan Kesehatan Avicenna, Kendari 93116, Southeast Sulawesi, Indonesia*

[*]*Email :mnurdin06@yahoo.com*

## Abstract

Synthesis of graphene electrodes modified TiO2-Calix[4]Arene (G@TC) has been successfully carried out using a mechanical homogenization method. Based on Scanning Electron Microscope (SEM) analysis results show that the G@TC electrodes are composed of rough surfaces with different grain sizes and have a dense structure with small pores. G@TC electrodes showed good voltammetric performance in the measurement of Cd2+ ions. In this case it occurs at optimum conditions including the use of Calix[4]Arene of 0.015 g and citrate buffer with pH = 5. During the measurement a reversible reaction occurs with both an oxidation potential (Epa) and a reduction potential (Epc) for the Cd²⁺ ion are 0.19 V and 0.25 V, respectively.

**Keywords:**$G@TC$, *electrochemical, voltammetry, detection, Cd²⁺*

# Highly sensitive determination of Pb (II) ions usinggraphene paste electrode modified TiO₂-ionophore calix[6]arene composite

N Dali[1], M Nurdin[1], A A Amasi[1], I Irwan, L O A Salim[1] and M Maulidiyah[1*]

*[1]Department of Chemsitry, Faculty of Mathematic and Natural Science, Universitas Halu Oleo, Kendari-Southeast Sulawesi, Indonesia*

*[*]E-Mail:maulid06@yahoo.com*

## Abstract

A new strategy for preparation of graphene paste electrode modified with TiO2-Ionophorehexa(p-tert butyl)hexa(ethyl ester)calix[6]arene (GPE/TiO2-BEK6) has been successfully developed and used to detect Pb2+ ions. The TiO2-P25 Degussa, BEK6, graphene powder and paraffin oil were mixed as an electrode composite. The surface morphology and electrochemical properties of the GPE/TiO2- BEK6 electrode were characterized by Scanning Electron Microscopy (SEM) and Cyclic Voltammetry (CV). The highest peak current for the oxidation-reduction (redox) of Pb2+ ion was obtained at pH 5 with a scan rate of 0.8 V/s. The presence of TiO2-BEK6 composite in graphene paste electrodes, the sensor detection for $Pb^{2+}$ exhibit a linear range, %RSD, and detection limit are 0,9613 ppm, 0.98%, and 0.04702 ppm, respectively. In addition, the presence of Cd2+ and Mn2+ interference ions in the analyte solution did not affect the performance of GPE/TiO2-BEK6 in detecting Pb2+ ions.

**Keywords:***GPE, TiO₂, BEK6, CV, $Pb^{2+}$*

# Electroanalytical measurement using carbon paste electrode modified TiO₂/Ag-Li (CPE-TiO₂/Ag-Li) in detection of fipronil compound

M Nurdin[1*], R Ruslan[2], T Azis[1], M Maulidiyah[1], F Mustapa[3], Z Arham[4], S Hadijah[1], and L O A Salim[1]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, UniversitasHalu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

[2]*Departement of Chemistry, Faculty of Mathematics and Natural Sciences, TadulakoUniversity, Palu 94118, Central Sulawesi, Indonesia*

[3]*Department of Aquaqulture, Faculty of Sciences and Technology, Institut Teknologidan Kesehatan Avicenna, Kendari 93116, Southeast Sulawesi, Indonesia*

[4]*Department of Mathematics and Natural Science, Institut Agama Islam Negeri(IAIN), Kendari 93116, Southeast Sulawesi, Indonesia*

[*]*E-mail: mnurdin06@yahoo.com*

## Abstract

The development of electrochemical sensors has become a topic that has been studied by many researchers, especially in improving the performance of carbon paste electrodes. This study aims to determine the performance of CPE-TiO2/Ag-Li in the determination of fipronil compounds by Cyclic Voltammetry (CV). The parameters electroanalytical are linearity, limit of detection (LOD), repeatability and selectivity. The measurement of fipronil solution by CPE-TiO2/Ag-Li for LOD and repeatability with the Horwitz Ratio (HR) value were 0.01 ppm and 0.11%, respectively. The optimum measurement stability of CPE-TiO2/Ag-Li in detection of fipronil compound was 10 days. The interfering compound test using CuSO4 in analyte solution has a significant effect on fipronil analysis which was characterized by a decrease in peak oxidation current. The content of fipronil in the real sample obtained was 0.253 ppm. This research can be used as an alternative pesticides control in agriculture.

**Keywords:**CPE, TiO₂, Ag-Li, fipronil, LOD.

# Bioethanol production based on OPEFB biomass using sulfuric acid followed by saccharification and co-fermentation simultaneously

M Nurdin[1*], H Abimanyu[2], R Cahyaningrum[1], M Maulidiyah[1], Z Arham[3], L O A Salim[1], M Natsir[1], and I Irwan[1]

[1] Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia

[2]Research Center for Chemistry, Indonesian Institute of Sciences, Kawasan PuspiptekSerpong, Tangerang Selatan 15314, Indonesia.

[3]Department of Mathematics and Natural Science, Institut Agama Islam Negeri (IAIN), Kendari 93116, Southeast Sulawesi, Indonesia

[*]Email: mnurdin06@yahoo.com

## Abstract

Currently, the production of bioethanol based on oil palm empty fruit bunches (OPEFB) has been utilized to obtain high chemical content such as cellulose, hemicellulose and lignin. However, it is not easy to produce bioethanol from lignocellulosic biomass waste, it needs to go through several stages of methods. For this reason, bioethanol production is focused on applying a simple method using sulfuric acid during the OPEFB pretreatment process and followed by the saccharification and co-fermentation (SScF) simultaneously. Based on these results, it was found that 6% sulfuric acid was the optimum concentration for the OPEFB pretreatment process. The effective recovery for xylose and acetic acid were 39.70% and 2.73 g/L, respectively. In addition, it was also found that the use of 10% sodium hydroxide was effective in increasing the purity of the cellulose residue by up to 30.65%. In this work, the best bioethanol yield was 42.42 g/L, this was obtained during the fermentation time of 48 hours.

**Keywords:**OPEFB, bioethanol, SScF, xylose, acetid acid

# Calcination Temperature Effect of Chicken Eggshells as A Heterogeneous Catalyst on The Biodiesel Production from Moringa Seed Oil

Ruslan[1*], J Hardi[1], I W S Adnyana[1]

*[1]Chemistry Department, Tadulako University, Palu, Indonesia*

*[*]Email: ruslan_abdullah66@yahoo.co.id*

## Abstract

The quality of heterogeneous catalysts is one of the important factors in the transesterification reaction or biodiesel synthesis reaction. The use of various temperatures for calcining chicken eggshells as heterogeneous catalysts in the manufacture of biodiesel from Moringa seed oil has been successfully carried out. This study aims to obtain the right calcination temperature for biodiesel production so as to produce the highest mass fraction of fatty acid methyl esters and also to determine the characteristics of the biodiesel produced. Heterogeneous catalyst CaO from chicken eggshells was prepared by calcining at temperatures of 700oC, 800oC, 900oC, 1000oC, and 1100oC. CaO catalyst at each calcination temperature was used in the transesterification reaction between Moringa seed oil and methanol. The use of a calcination temperature of 11000C resulted in a mass fraction of 90.69% methyl ester. The results of biodiesel characterization obtained water content of 0.28%, acid number 0.03 mg KOH/g, saponification number 147.6 mg KOH/g, iodine number 71.06 g iodine/100 g, mist point 18oC, pour point 13oC, and the cetane number 65.15. Some biodiesel quality values have met ASTM standards, including acid number, saponification number, and cetane number. The results of GC-MS analysis showed that 9-Octadecenoic acid (Z)-methyl ester was the dominant compound in biodiesel with a peak area of 6.59% at a retention time of 12.39 minutes.

**Keywords:***Heterogenous catalyst, chicken eggshells, biodiesel, calcination, moringa seed oil*

# Synthesis and Characterization of Electrode Ag-S-TiO2/Ti for Enhanced Photocatalytic Degradation of Methylene Blue

R Ruslan[1], M Maulidiyah[2], M L Andarini[2], A. Musdalifah[2], L O A Salim[2], and

M Nurdin2*

[1]*Departement of Chemistry, Faculty of Mathematics and Natural Sciences,Universitas Tadulako, Palu 94118, Central Sulawesi, Indonesia*

[2]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, UniversitasHalu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

*\*E-mail:mnurdin06@yahoo.com*

## Abstract

In this work, we investigate the effect of adding metal and nonmetal dopant to the TiO2/Ti electrode on the degradation of methylene blue dye by photoelectrocatalyst. TiO2 thin film growth on the surface of Ti metal was applyed by the anodizing, dip-coating and electrodeposition method. Ag-S-TiO2 thin film growth on the surface of Ti metal was applied by anodizing, dip-coating, and electrodeposition methods. Characterization of the electrode was carried out using Scanning Electron Microscope-Energy Dispersive X-ray (SEM-EDX), Fourier Transform Infra-Red (FTIR) and Linear Sweep Voltammetry (LSV). The results of the characterization of surface morphology using SEM-EDX for element composition of Ag and S were 4.9 wt% and 42.9 wt%, respectively. FTIR showed vibrations between the Ti-O bond with a wavenumber 836 cm-1 and Ti-S bond with a wavenumber 1040 cm-1. Based on the photoelectrocatalyst performance test, TiO2/Ti electrode was active in ultraviolet (UV) light irradiation, while the Ag-S-TiO2/Ti electrode was active in visible (Vis) light irradiation. The maximum degradation of Ag-S-TiO2/Ti electrodes against methylene blue organic compounds under visible light irradiation in concentration of 0.5 ppm was 83.52%.

**Keywords:***TiO$_2$/Ti, Ag-S-TiO2/Ti, photoelectrocatalyst, degradation, methylene blue*

# Inhibitory activity of Candida albicans fungi by acetone extract of the lichen Usnea sp.

M Maulidiyah[1*], S Saprin[2], L Diraa[2], M Natsir[1], U Usman[3], N Nurlansi[4],A Musdalifah[1],

L O A Salim[1], and M Nurdin[1]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

[2]*Department of Pharmacy, Faculty of Sciences and Technology, InstitutTeknologidan Kesehatan Avicenna, Kendari 93116, Southeast Sulawesi, Indonesia*

[3]*Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Mulawarman, Samarinda 75119, East Kalimantan, Indonesia*

[4]*Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

[*]*E-mail:i.maulid06@yahoo.com*

## Abstract

Lichen is a unique organism that produces various organic compounds such as primary and secondary metabolites. In this study, we focused on reporting the growth inhibitory activity of Candida albicans fungi by acetone extract of the lichen Usnea sp. Lichen powder was extracted by maceration method for 3x24 hours using acetone solvent. The results of phytochemical screening showed that the extract contained a class of chemical compounds such as alkaloids, saponins, tannins and flavonoids. Bioactivity test against inhibition growth of C. albicans fungi at concentrations of 1.25%, 2.5% and 5% were 16.0 cm, 32.5 cm and 39.0 cm, respectively. The results of this study are a very important report to the exploration of natural product compounds to treat the candidiasis disease caused by the C. albicans fungi.

**Keywords:***lichen, Usnea sp., extract, C. albicans, inhibitory.*

# Antibacterials activity of Escherichia coli and Salmonella typhi by acetone extract of the lichen Usnea sp.

A N T Adjeng[1], A Darmawan[2], B Vika[3], A Musdalifah[4], U Usman[5],N Nurlansi[6]

, L O A Salim [4], M Nurdin[4], and M Maulidiyah[4*]

[1]*Department of Pharmacy, Faculty of Medicine, Universitas Lampung, Bandar Lampung 35145, Lampung, Indonesia*

[2]*Research Center for Chemistry, Indonesian Institute of Sciences, Banten 15314, South Tangerang, Indonesia*

[3]*Department of Pharmacy, Faculty of Sciences and Technology, InstitutTeknologidan Kesehatan Avicenna, Kendari 93116, Southeast Sulawesi, Indonesia*

[4]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

[5]*Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Mulawarman, Samarinda 75119, East Kalimantan, Indonesia*

[6]*Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Halu Oleo, Kendari 93232, Southeast Sulawesi, Indonesia*

[*]*E-mail:maulid06@yahoo.com*

## Abstract

Lichen organisms have been used by the community as traditional herbal ingredients, especially lichens of the genus Usnea sp.. In this study, we focused on examining the effect of the acetone extract lichen Usnea sp. in inhibiting the growth of Escherichia coli and Salmonella typhi bacteria. The sample of Usnea sp. lichen was extracted using the maceration method with acetone solvent for 3×24 hours. An antibacterial test was carried out by measuring the diameter of the inhibition zone using a calliper. The results of the antibacterial test on inhibition zones at concentrations of 1.25%, 2.5%, and 5% were 21.25 mm, 26.33 mm, and 30.5 mm (E. Coli) and 23.08 mm, 26.41 mm, and 33.0 mm (S. typhi), respectively. The lichen organism Usnea sp. has very potential for treating diarrhea and fever.

**Keywords:***lichen, Usnea sp., antibacterial, E. coli, S. typhi*

# Antioxidant and Antidiabetic Activity Oo Rhizophora Mucronata Mangrove Leaf Extract

Usman[1*], AmirMasruhim[1] and AgungRahmadhani[1]

[1]*Mulawarman University*

*E-mail:*[usman@fkip.unmul.ac.id](usman@fkip.unmul.ac.id)

## Abstract

Rhizophora mucronata is a plant that dominates the mangrove forest in the Muara Badak Beach area, East Kaimantan, Indonesia. The benefits of mangrove plants as a source of bioactive compounds that can be used as drugs, antibiotics, and cosmetic ingredients. However, the potential of mangrove plants has not been fully utilized. This study aims to determine the secondary metabolites, antioxidant activity, and antidiabetic compounds of methanol, dichloromethane, and ethyl acetate extracts of mangrove leaves R. mucronata. Leaf samples were extracted by maceration using methanol, dichloromethane, and ethyl acetate as solvents. Each extract was tested with qualitative phytochemicals, antioxidant activity test using DPPH (1,1-diphenyl-2-picrylhydrazyl) method and antidiabetic test using blood glucose tolerance method. The results of the phytochemical test showed that the methanol extract of the leaves of R. mucronata contained compounds; alkaloids, flavonoids, phenolics, triterpenoids, and saponins. Dichloromethane extract contains flavonoid and steroid compounds. Ethyl acetate extract contains compounds; alkaloids, flavonoids, phenolics, triterpenoids, tannins, and saponins. The antioxidant activity of vitamin C has the smallest $IC_{50}$ value of 5.41 ppm, followed by ethyl acetate extract with an $IC_{50}$ value of 34.64 ppm, then dichloromethane extract has an $IC_{50}$ value of 93.25 ppm, and finally methanol extract with an $IC_{50}$ value of 100.64 ppm, This means that the ethyl acetate extract has stronger antioxidant activity than other extracts. The highest percentage decrease in blood glucose levels of mice in methanol extract occurred in

treatment D-2 (dose of 600 mg/Kg bw) of 46.81%, dichloromethane extract and ethyl acetate occurred in treatment D-3 (dose of 1,200 mg/Kg bw) respectively. -respectively 21.81% and 58.74%. R. mucronata leaf extract contains secondary metabolites of alkaloids, flavonoids, phenolics, steroids, triterpenoids, tannins and saponins. The antioxidant activity of the ethyl acetate and vitamin C extracts had an IC50 value of <50 ppm including the very strong category, the dichloromethane extract having an IC50 value of <100 ppm including the strong category, and the antioxidant activity of the methanol extract in the moderate category with an IC50 value of > 100 ppm. The percentage decrease in blood glucose levels of mice in the ethyl acetate extract was higher than that of the methanol and dichloromethane extracts. So that the ethyl acetate extract has the potential to be developed as an alternative natural antioxidant and antidiabetic drug.

# Effect Comparative Composition of Geopolymer Based- Bottom Ash and Brick Ash to be Apllied as Refractories

Yulianti Malik [1], Yusdianto [2], Rustam Musta[3], Kamaluddin[1]

*[1]Politeknik IndustriLogamMorowali*

*[2]Politeknik ATI Makassar*

*[3]Universitas Halu Oleo,*

*[*]Corresponding*
*author's:yuliantimalik04pilm@gmail.comymalumbot@gmail.comrustammusta@yahoo.comkamaluddin.pjl@gmail.com*

## Abstract

The consumption of coal in generating units, especially in the metal industry, causes an increase in industrial waste such as bottom ash. When viewed from the elements contained in it, bottom ash generally contains $SiO_2$, $Al_2O_3$, $Fe_2O_3$, CaO, MgO, $Na_2O$, $TiO_2$ and C, making bottom ash has unique properties that can be applied to various fields, one of which is as a mixture for refractory manufacture. The bricks were chosen as a geopolymer mixture that will be applied as a refractory because of the silicate content possessed by bricks made of clay that has undergone combustion so that it has minimal impurities and is relatively cheap and easy to procure. In this study, geopolymers based on bottom ash and bricks for refractory applications were made using an activator solution as a binder consisting of NaOH and $Na_2SiO_3$ (8 M concentration), the required S/L ratio (5.4 g/ml), pre-curing for 2 days, curing for 12 hours at a temperature of 110 oC with variations in the composition ratio (0:1), (1:1), (2:1), (3:1). Physical properties test showed that the higher the composition of the addition of bricks, the PLC (-0,04,) MOR (22, 45), CCS (164, 03) and PCE values tended to increase which was equivalent to a temperature of 1398 oC. While the results of XRD characterization, it was found that the geopolymer based on bottom ash and bricks contains several compounds, namely: diopside, jahnaugite, forsterite and fayalite.

**Keywords:***geopolymer based-bottom ash and bricks, composition, refractories.*

# IDENTIFICATION OF THE SUBSEQUENT SURFACE LAYER OF THE LIQUIFACTION REGIONS OF JONO OGE, LOLU AND SIDERA VILLAGES USING GEO-ELECTRICAL METHOD

Badaruddin [1*], Sabhan [1], Maskur [1], Mauluddin Maul[1] and Sitti Rugayya[1]

*[1]Tadulako University*

*[*]E-mail:badarfisika@gmail.com*

## Abstract

Central Sulawesi has the Palu Koro Fault at any time which can cause an earthquake. One of the impacts caused by this earthquake is liquefaction. The purpose of the study was to identify the subsurface layer that is suspected to be one of the causes of liquefaction in the Sigi Biromaru district including in Jono Oge village, Lolu village and Sidera village. The stages of this research method to determine the subsurface layer using the geoelectric method of the Schlumberger configuration and the Wenner-Schlumberger configuration. The results showed that the three locations had a layer of clay at a depth of 10-15 m bmt which formed a continuous layer with a thickness of 7-12 m. Above the clay layer consists of a layer of sandy loam, sand and gravel to near the surface.

**Keywords:***Earthquake, Liquefaction, Geoelectricity, Geology*

# Evaluation performance and two proposing ways to increase the efficiency of the electrostatic precipitator at Electric Power Plant PT. Semen Tonasa

Sri Suryani[1*], Alimuddin Hamzah Assegaf[1], Bannu[1] and Arsi Amalia[1]

[1]*Hasanuddin University*

[*]*E-mail:tamalanreah3@gmail.com*

## Abstract

Electrostatic Precipitator (EP) is a filterless device that removes fine particles from a flowing gas resulting from coal combustion. This device has the function of minimizing dust particulates released by the chimney. The EP efficiency should be 99.9% if the performance of the tool is in optimum condition, but with the longer operation of the device, the efficiency will decrease. Therefore, a study was conducted to find a way to increase the efficiency of the performance of the EP, so that the particulate emissions released by the chimney are minimized. This research was conducted at Electric Power Plant PT. Semen Tonasa, Pangkajene Islands Regency. This type of research was a survey using quantitative descriptive methods in the form of field data collection, as well as field data processing. At the research site, there were two Electric Power Plants with current performance having an efficiency of 65.86% for Electric Power Plant 1 and 87.85% for Electric Power Plant 2. The results showed that the concentration of particulate emissions emitted by the chimney was still lower than the standard value for particulates emission stated in the regulations of Governor of South Sulawesi in 2010. This efficiency can be increased by reducing the flow rate by 2.45 m3/s for Electric Power Plant 1, so that the optimum efficiency is 99.86%, and for Electric Power Plant 2, the flow rate can be adjusted to 6.48 m3/s to achieve an efficiency of 99.85%. We can also have optimum efficiency of EP by increasing the migration velocity from 0.27 cm/s to 1.64 cm/s for Electric Power Plant 1, and from 0.85 cm/s to 2.63 cm/s for Electric Power Plant 2.

**Keywords:***Electrostatic Precipitator, migration velocity, flow rate*

# Drone for Disaster Monitoring, Case Study : Multi Disaster In Palu And Sigi After 28 September 2018

M. Kurniawan[1*], Asrafil[2*], Abdullah[1], M. Rusli[1*], S. Rugayya[3*]

[1]*Geophysics, Physics Departement, Tadulako University, Indonesia*
[2]*Geological Engginering Study Programe, Tadulako University, Indonesia*
[3]*Physics Departement, Tadulako University, Indonesia*

[*]*Corresponding author's:maul.kurniawan121216@gmail.comasrafil@untad.ac.id*

## Abstract

Utilization of drones in order to obtain high-resolution imagery for disaster research has progressed into actual implementation in recent years. This paper describes the use of drones to support monitoring disaster that occured in palu and sigi after the of September 28, 2018 earthquake. The method used in this research is focus on using of drones for monitoring the image of the area affected by the disaster. The analysis used in this paper to compare the time lapse image before and after the disaster. After the earthquake on 28 September 2018 triggered multiple disasters that occurred in Palu and Sigi areas including the tsunami, liquefaction, land subsidence, landslides and flash floods. The result of the acquisition shows the actual image of the condition of how large the area has been affected by the multi-disaster. In multiple disaster monitoring, the use of drone images is very important, because it is very efficient and low cost.

**Keywords:***Drone, Multi Disaster, Monitoring*

# Comparative Study of Beta Radiation Dose in Si homojunction and ZnO-Si heterojunction with Pm-147 Radioisotope For Betavoltaic Application

Swastya Rahastama[1*], Rajendra Salim[1] and Abdul Waris[2]

*[1]Institut Teknologi Kalimantan*

*[2]Institut Teknologi Bandung*

*[*]E-mail:swastya.r@lecturer.itk.ac.id*

## Abstract

In this study, we compared the beta radiation response in the basic Si homojunction betavoltaic battery and the proposed model of ZnO-Si Hetero p-n structure due to the illumination by Pm-147 radioisotope. Monte Carlo N-Particle code is used to simulate the beta particle interaction with the semiconductor and calculate the energy deposition of beta particle. The photonic generation due to the bremsstrahlung effect is also calculated. Furthermore, the generation rate of electron-hole pairs is also calculated as a preliminary data which is necessary to predict the electrical performance for ZnO-Si betavoltaic. The result of simulation shows that the ZnO-Si heterostructure reduces about 10% of the total energy deposition in the p-type region, since ZnO is a denser material. A reduction in the beta energy degradation rate per thickness is observed, which leads to a higher concentration of the beta energy in the n-type region. As a result, ZnO-Si heterojunction has a higher generation rate at the front layer compared to Si homojunction which is distributed more evenly.

**Keywords:***betavoltaic, heterojunction, homojunction, MCNP, Pm-147*

# Pullout Strength Evaluation of Titanium Pedicle Screw at Different Grade of Polyurethane

Damisih[1*], Razie Hanafi[1], M. Dikdik Gumelar[1], Joni Sah[1], Adita Wardani Rahmania[1], Dwi Gustiono[1], Nurlina[1], Bambang Triwibowo[1], Muhammad Kozin[1] and I Nyoman[1]

[1]*Agency for the Assessment and Application of Technology*

*E-mail:damisih@bppt.go.id*

## Abstract

Pedicle screw has been widely used for spine surgery to treat spinal instability and disorder. One of mechanical properties from pedicle screw which is very important for its clinical application is pullout strength. It relates with holding power of pedicle screw and be able to cause screw failure. The main purpose of this work is to assess pullout performance of self-designed pedicle screw manufactured from Ti-6Al-4V ELI alloy in different grade of rigid polyurethane. The pullout test was performed in accordance with ASTM F 543-17 using universal testing machine. Two grades of polyurethane i.e., grade 5 and grade 20 which has different density were used as test block material according to ASTM F 1839-08 representing osteoporotic and normal bone. Prior to the pullout test, Ti-6Al-4V ELI as raw material was also characterized through chemical composition analysis and tensile test to know its conformity with ASTM F 136-13. It showed Ti-6Al-4V ELI has fulfilled the requirement of the standard. The result of pullout test indicated that the pedicle screw inserted to grade 20 of polyurethane which has higher density also provided greater pullout strength than those inserted to grade 5. Pull out strength was obtained of 53.1 N and 1065.4 N for grade 5 and grade 20, respectively. It was found that the density of polyurethane test block has significant effects on to pullout performance. However, it was only pedicle screw with grade 20 of test block met the specification of pullout range on ASTM F 1839-08 standard. Thus, it should be taken onto consideration for clinical application in different type of patient bone and becomes valuable input for further development of pedicle screw design regardless of materials choice.

**Keywords:***pullout, pedicle screw, spinal implant, titanium, polyurethane.*

# Reduction of COD and BOD of Palm Oil Mill Effluent by The Palm Frond (Elaeis guenensis Jacq) Activated Charcoal

Dwi Juli Puspitasari[1*], Fitriani[1], Prismawiryanti[1]

[1]*Department of Chemistry, Mathematics and Natural Science Faculty Tadulako University, Palu, Indonesia*
*E-mail:dwijulipuspitasari@gmail.com*

## Abstract

Palm oil mill effluent is a by-product of processing oil palm bunches into crude palm oil. The effluent contain material organic that cause problems for the environment adsorbent is used to minimise the organic material content. One of the potential materials for adsorbent is palm fronds because they contain lignin, hemicellulose and cellulose. The aim of the research was to determine the contact time and optimum pH to decrease COD and BOD levels in palm oil industrial wastewater. Activated charcoal from palm fronds was obtained from the carbonization process at a temperature of $300^oC$ for 1 hour, then activated using 1 M $ZnCl_2$. The quality standards of the activated charcoal is according to SNI 06-3730-1995. The optimum contact time occurred at 50 minutes with the percentage decrease in COD and BOD levels of 70.83% and 63.11%, respectively, while the optimum pH was reached at pH 7 with a decrease in the percentage of COD and BOD levels of 69.57% and 67.87%, respectively.

**Keywords:***The palm frond, Activated Charcoal, Palm oil mill effluent, BOD,COD.*

# The Identification of Fault in Sibedi Village, Marawola Subdistrict, Sigi Regency, Using Geoelectrical Resistivity Method

Sandra[1], Maria Fransiska Sepe[2],Jamidun[1] and Hosiana Md Labania[2]

*[1]Geophysical Engineering Tadulako University*
*[2]Physics Tadulako University*

*\*E-mail:sandrafisika@gmail.com*

## Abstract

The identification of fault lines has been conducted in Sibedi Village, Marawola Subdistrict, Sigi Regency, using geoelectrical resistivity method. This study aims to identify fault lines found in Sibedi Village. These measurements were carried out on 5 trajectories using the Wenner configuration of geoelectrical resistivity method. The data obtained were processed using 2D Eartimager Software. The processing result obtained an overview of geological structures in the form of faults in line 1, line 2, and line 5 with 94-250 $\Omega$m type resistance value which is a layer of sand separated by a weak zone of clay and silt layer with a resistance value of type 5,0-58,6 $\Omega$m which occurs on the surface with a depth of 6-11 m (asl), at the coordinates of Line 1 0058'20,4'' LS-119051'38,5'' BT, Line 2 0058'14,6'' LS-119051'38,1'' BT, Line 5 0058'29,0'' LS-119051'39,1'' BT. Separation of layers that occur suddenly is a sign of a fault.

**Keywords:***Eartimager, Geoelectric, The Fault, Wenner.*

# Application Of The Resistivity Method In The Investigation Of Subsidence And Soil Creep Case Study Of The Balikpapan - Samarinda Road Section, Indonesia

Febrian Dedi Sastrawan[1*], Rahmania[1], Meidi Arisalwadi[1]

[1]*Physics Department, InstitutTeknologi Kalimantan, Balikpapan, Indonesia*

[*]*E-mail:febrian.dedi@itk.ac.id*

## Abstract

Subsurface investigations of the Balikpapan – Samarinda road section were carried out because there was a lot of subsidence and soil crawling. The purpose of this investigation is to determine the characteristics of rocks below the surface. Rock characteristics greatly affect the occurrence of subsidence and soil creep. Subsidence and soil crawling will cause road damage, which causes disruption of vehicle mobility. The method used in this investigation is the resistivity method. This method takes advantage of differences in the resistivity values of rocks below the surface. The results of the investigation are a 2D cross-section of the subsurface resistivity. Based on the interpretation results, it is known that the resistivity value of 4 ohm.m – 40 ohm.m is estimated as a clay layer. This layer is very easy to change in volume when it receives pressure so that it can cause soil subsidence, besides that this layer can also act as a slip plane that causes soil creep. The resistivity value of 40 ohm.m – 353 ohm.m is estimated as a sandy clay layer that is easily deformed so that this layer can also cause soil subsidence. The resistivity values of 353 ohm.m – 800 ohm.m are estimated as coal inserts.

**Keywords:***Subsurface, Resistivity, Subsidence, Soil Creep, Deformed.*

# Estimation Of Depth And Characteristics Of Subsurface Acuifer Layer Using Resistivity Method In Lansot Village, North Minahasa District, Indonesia

Febrian Dedi Sastrawan[1*], Windy Adriani[1], Muhammad Rusli[2]

*[1]Physics Department, Institut Teknologi Kalimantan, Balikpapan, Indonesia*

*[2]Geophysical engineering, Tadulako University, Palu, Indonesia*
*[*]E-mail :febrian.dedi@itk.ac.id*

## Abstract

Water is one of the most important and most needed natural resources in the world and in Lansot Village, North Minahasa Regency. The need for clean water that is not matched by the availability of water sources is a major problem in meeting clean water needs. Based on this, research is needed to determine the existence of the aquifer layer below the surface. This study aimed to determine the depth and characteristics of the aquifer in the study area. The method used is the resistivity method using the Schlumberger configuration. The result of data processing is a 1D cross-section of subsurface resistivity. The results of the interpretation show that the clay layer with resistivity values of 1.29 ohm.m – 6.98 ohm.m is estimated to be an aquiclude layer that is impermeable to water with the characteristics of not being able to channel water. a layer of sand with a resistivity value of 22.3 Ohm.m – 61.8 Ohm.m is estimated as a confined aquifer layer between the clay layers. The aquifer layer can be found at a depth of 11 m - 58 m below the surface.

**Keywords:***confined aquifer, aquiclude, resistivity, availability of water, sand layer.*

# Identification of rainfall variability in the Northern coast of Java

V C Agusta[1,3] and M R Putri[1,2]

[1]*Study Program of Earth Sciences, Faculty of Earth Sciences and Technology, Bandung Institute ofTechnology,Labtek XI ("Labtek Biru") 2nd Floor, Jalan Ganesha No 10, Bandung, 40132, Jawa Barat, Indonesia.*

[2]*Research Group of Oceanography, Faculty of Earth Sciences and Technology, Bandung Institute of Technology,Labtek XI ("Labtek Biru") 2nd Floor, Jalan Ganesha No 10, Bandung, 40132, Jawa Barat, Indonesia.*

[3]*Paleoclimate and Paleoenvironment Research Group- R.C for Geotechnology- Indonesian Institute of Sciences(LIPI), Jl. Sangkuriang Bandung, Jawa Barat 40135, Jawa Barat, Indonesia.*
[*]*E-mail:verachristanti.agusta@gmail.com*

## Abstract

This research aims to understand the rainfall variability in the Northern coast of Java. Daily rainfall data from three meteorology stations were employed to analyze rainfall periodicities, maximum and minimum variability, and rainfall anomalies. Rainfall data period January 2017-July 2020 from meteorology stations in Cirebon, Tegal, and Semarang area are used to understand the rainfall periodicity. The fast Fourier Transform (FFT) is proposed to transform data from the time-series domain into data in the frequency domain for each station. Rainfall data period 1991-2020 are used to identify maximum-minimum variability and rainfall anomalies. The result showed that maximum rainfall event in Cirebon, Tegal, and Semarang region occurs during northwest monsoon (November to February), shown by the FFT diagram with period 186 days and 341 days every year. Rainfall shifting is shown by rainfall anomaly in Tegal area. The maximum rainfall period has shifted from December-January-February (DJF) season to June-July-August (JJA) season in 1991-2015 as an effect of the La Nina event. Period 2015-2018 showed minimum rainfall event as a response to the 2015/16 Super El Nino event. This research identifies the rainfall variability and its interaction with global climatic events.

**Keywords:***Rainfall, Anomalies, Rainfall variabiliy, ENSO*

# Signal Characteristics Bromo Volcano Eruption In 2015 Based on Time-Frequency Analysis (TFA)

Meidi Arisalwadi[1], FebrianDedi Sastrawan[2], Rahmania[3], HettyTriastuty[4]

*[1]Physics Department, Kalimantan Institute Of Technology*

*[2]Physics Department, Kalimantan Institute Of Technology*

*[3]Physics Department, Kalimantan Institute Of Technology*

*[4]Center for Volcanology and Geological Hazard Mitigation, Geological Agency,Ministry of Energy and Mineral Resources*

*[*]E-mail:meidiarisalwadi@lecturer.itk.ac.id*

## Abstract

Bromo Volcano is one of a series of active volcanoes in Indonesia which is located within the Tengger caldera, Probolinggo Regency, East Java. Bromo Volcano increased volcanic activity (seismic signals) at the end of 2015 to early 2016. The study was conducted to determine the characteristics of volcanic earthquakes. The method used to determine the characteristics of volcanic or volcanic seismic signals is the time frequency analysis (TFA) method. In the method, it can be seen that the frequency value is read from the spectrogram. The frequency that is read will describe the signal character of the Bromo volcano. Knowing the characteristics of volcanic signals is part of volcanic monitoring. Bromo Volcano eruption volcanic there are signals of type B, volcanic tremor and signal tectonic earthquake.

**Keywords:***volcanic, seismic, frequency, spectrogram*

# Identification of Surface Faults Using theResistivity Geoelectrical Method in Dalaka Village, DonggalaRegency, Central Sulawesi

M. D. T. Musa[1*], M. Kurniawan[1*], A. Wahyu[2], Y. Mudin[2*], Sandra[1*], Badaruddin[1*]

[1]*Geophysics, Physics Departement, Tadulako University, Indonesia*

[2]*Physics Departement, Tadulako University, Indonesia*

[*]*E-mail:ochad_8795@yahoo.co.id*

## Abstract

28 September 2018 there was an earthquake with an epicenter 26 km North of Donggala with a magnitude of 7.4. This earthquake triggers the occurrence of other natural phenomena such as landslides, tsunamis, fractures and cracks in the ground surface, and liquefaction. In some places, fault outcrops appear on the surface. In Dalaka Village, fault outcrops were found on the surface. In this study, the geoelectrical method of resistivity is used which aims to determine the subsurface structure based on the nature of the rock type resistance. Based on the results of measurements and outcrops found on the surface of the faults in this region, it has a north-south orientation. The fault plane in this region occurs at the contact between sandstone and marl.

**Keywords:***Surface Faults, Resistivity, Geoelectrical Method.*

# Antioxidant, Total Phenolic Content and Antibacterial Activity of leaves extract from local and endemic Nepenthes maxima Reinw. ex Ness from Poso, Central Sulawesi.

Pasjan Satrimafitrah[1*], Indriani[1], Sakinah Ahmad[1], Febriska C Milang[1], Wahyu Nugrawati[1], Moh. Iqbal[2], Nov Irmawati Inda[1] and Ahmad Ridhay[1]

[1]*Department of Chemistry, Faculty of Mathematics and Natural Sciences, Tadulako University*
[2]*Department of Biology, Faculty of Mathematics and Natural Sciences, Tadulako University*

[*]*E-mail:pasjan82@gmail.com*

## Abstract

Nepenthes sp. has been widely used by the community as a traditional medicine to treat various diseases and posses pharmacological effects such as antibacterial, antifungal, antioxidant, antimalarial, antidiabetic, and hypolipidemic. This study aims to identify secondary metabolites, antioxidant activity, total phenolic contents, and antibacterial activity in leaf extract of endemic Nepenthes maxima Reinw. ex Ness, a special variety from Poso, Central Sulawesi. The antioxidant activity test was carried out using the DPPH method, total phenolic content was tested using the Folin-Ciocalteu method, and an antibacterial test was performed with the agar diffusion method. The results of the antioxidant activity test on leaves showed that the methanol extract had a stronger activity with an IC50 of 72.7905 g/mL with a total phenolic content of 610.145 mg GAE/g extract followed by ethyl acetate extract with an IC50 of 105.1922 g/mL a total phenolic content of 194.357 mg GAE/g extract. Both extracts exhibited antibacterial activities against several tested bacteria. It is suggested that leaf extract of Nepenthes maxima has good antioxidant activity in reducing free radicals and mild antibacterial activity.

**Keywords:***Nepenthes maxima Reinw. ex Ness, Antibacteria, Antioxidant, Phenolic content.*

# Physicochemical study of extracts of Jarak leaf (Jatropha curcasL.) and Papaya leaf (Carica papaya L.) and their application as photosensitizer agents in aPDT system of Staphylococcusepidermidis biofilm

SyahrulRamadhan[1], Sri Dewi Astuty[2*], Bannu[2], Sri Suryani[3], Bidayatul Armynah[4], Muhammad Zain[1], and Enggrianti[1]

[1]*Student of Physics Department, Mathematics and Science Faculty, HasanuddinUniversity.*

[2]*Optic and Spectroscopy Laboratory, Physics Department of FMIPA, HasanuddinUniversity.*

[3]*Material and Energy Laboratory, Physics Department of FMIPA, HasanuddinUniversity.*

[4]*Electronics and Instrumentation Laboratory, Physics Department of FMIPA,HasanuddinUniversity.*

[*]*E-mail:dewiastuti@fmipa.unhas.ac.id*

## Abstract

Jarak leaves (Jatropha curcas L.) and Papaya leaves (Carica papaya L.) are known as traditional medicines and are being developed as photosensitizer agents in antimicrobial photodynamic therapy (aPDT) based on their antimicrobial substance content and chlorophyll pigment. Photosensitizers in the aPDT system sourced from natural materials have great potential because they are widely available, easy to produce, and have a high level of purity. The chlorophyll pigments have been used as a photosensitizer agent because it has a long lifetime in the triplet state, so it is very likely to produce reactive oxygen species (ROS) compounds. This study examines the potential of two medicinal plants that contain antimicrobial substances through the characteristics of light absorption (UV-Vis spectrum) and emission properties (fluorescence spectrum). The study was validated by proving the potency of the two extracts when applied as a photosensitizer to the photoinactivation system of the Staphylococcus epidermidis biofilm. In addition to physicochemical analysis including absorption spectrum profiles, quantum yields, and

XRD characteristics, the photosensitizer potential was assessed from the percent inactivation and levels of malondialdehyde (MDA). The results showed that with the use of Jarak leaf extract, the optimal inhibition value was 65.55% while the use of Papaya leaf extract was 46.63%. From the results of the MDA test, it was obtained that the Jarak leaf extract was 0.376 nmol/mL. This indicates that the extracts of Jarak leaves and Papaya leaves have the potential to be used as photosensitizer agents in the aPDT biofilm of S. epidermidis.

**Keywords:***S.epidermidis, chlorophyll of Jarak leaves and papaya leaves, MDA levels.*

# Estimation of CT Number Linearity and Uniformity of Computed Tomography Scan by using Water CIRS Phantom at the Sayang Rakyat Hospital of Makassar

Syamsir Dewang[1*], Sri Dewi Astuty[1], Mulyadin[2], SittiRamlahRamlan Dhara[3]

[1]*Medical Physics Concentration of Physics Department, Faculty of Mathematics &NaturalSciences,Hasanuddin University, Makassar.*

[2]*Health Facility Security Center of Makassar.*

[3]*Sayang Rakyat Hospital, Makassar.*
[*]*E-mail:dewang1163@gmail.com*

## Abstract

The use of Computed Tomography (CT) Scan is very widely used in the field of radiology for the diagnosis or therapy of patient disease. The results of CT images can be reviewed by doctors to analyze the type of patient's disease. Physical quantities of CT image values are expressed in Honsfield Units (HU). One of the methods used to determine the quality of the resulting image is to determine the level of linearity and uniformity of the CT image value by determining the HU value in the regent of Interest (RoI) area. This research examines the quality of CT Scan images using a CIRS water phantom to assess image quality by determining the level of uniformity and linearity of images on CT Scans at Sayang Rakyat Hospital, Makassar. The results obtained indicate that the level of uniformity and linearity of the CT Scan image obtained is in accordance with the requirements of the Nuclear Energy Supervisory Agency.

**Keywords:***computed tomography scan, image quality, honsfield unit, regent of interest (RoI).*

# GEOMETRY TRANSFORMATION DIGITAL ONLINE BOOK WITH GUIDED NOTE TAKING (GNT) MODEL FOR DISTANCE LEARNING

Lusi Masduki[1] and Pukky Ngastiti[2]

*[1]Universitas Terbuka*
*[2]Universitas Billfath*

*[*]Corresponding author's:lusi@ecampus.ut.ac.idtetralian1010@gmail.com*

## Abstract

During the pandemic, distance learning strategies are very important because they can increase student interest and motivation to learn. For students at open universities and billfath universities, they apply an online learning system, but in the learning process, there is no suitable model and media for students. The digital online book developed in this study is a guided note taking model and can be used online so that it can support online lectures. The purpose of the results of this study is to produce a valid product in the form of an online digital media book with a guided note taking model in the transformation geometry course. Meanwhile, this research method uses the Borg and Gall development model with 10 stages. In the second year, namely conducting product revisions and expanded testing. Based on the results of the validity tests conducted by media experts and material experts through the questionnaires that have been given, the average results of online book digital assessments by media experts are 90%. While the average online book digital assessment by material experts is 87%. It can be concluded that the results of the online book digital media assessment using the guided note taking model for material experts and media experts are valid, namely 88.5%. The conclusion of this research is that a valid online book digital product has been produced and is ready to be tested on students from the open university and billfath university as an additional medium for online learning during the pandemic.

**Keywords:***Digital Online Book, Guided Note Taking, Validity Test*

# E-book media vector and coordinate system with augmented reality in pandemic period

PukkyNgastiti[1*], Aris Alfan[1] and Ahmad Umam[1]

*[1]Universitas Billfath*

*E-mail:digitalonlinebook20@gmail.com*

## Abstract

Technology in the digital era, there are many that can be used in the field of learning. In times of pandemic technology is very important to support distance learning. The researcher developed E-book media vector and coordinate system with augmented reality in analytic geometry course. The aim of the researcher is to analyze the coordinate and vector system in three dimensions through the application of augmented reality. This study uses the ADDIE development model which consists of five stages which include analysis, design, development, implementation and evaluation. Based on the results of the validity test conducted by media experts through a questionnaire, it was found that the media application was suitable to be used as a learning medium. While the validity test results by the material experts through the questionnaire obtained the results of material that is suitable for use as a learning medium. From the results of media experts and material experts, it can be concluded that it is feasible to be tested on students. The conclusion of this research is that the E-book media vector and coordinate system with augmented reality has been produced which is ready to be tested on billfath university students as alternative for learning media in pandemic period.

**Keywords:***Augmented Reality, E-book, Validity.*

# CHARACTERISTICS OF ROCK MASS IN LEANG-LEANG ANCIENT PARK KARST MAROS TN BANTIMURUNGBULUSARAUNG AREA

Muhammad Arsyad[1*], Pariabti Palloan[1] and Agus Susanto[1]

[1]*Lecturers at Postgraduate State University of Makassar*

[*]*E-mail:m_arsyad288@unm.ac.id*

## Abstract

Research has been conducted with the aim to describe the characteristics and reveal the degree of weathering of rocks and caves in the Leang-Leang Ancient Park (TP) Karst Maros TN Babul Area. The study was located at 04°58'43.1" LS and 119°40'35.0" BT. The study uses techniques of rock mass analysis and direct observation in the field. The results showed that the mass of the rock is in category II or good, but in certain parts there are holes that are small in diameter and have a special color. Diameter ranges from 0.1 cm - 20 cm with varying depth, so it becomes a gathering place for rainwater. In the research site there are also 2 (two) caves that have a high antiquity value, namely Leang Pettae Cave and Leang Petta Kere Cave. Leang Pettae Cave, included in the category of burly type of sheet is at 458'44.6" LS and 11940'30.5" BT with an altitude of 50 m above sea level. The cave faces westward with a height of 7 (seven) m and a width of 2 (two) m. Archaeological remains other than paintings of deer pigs and palms are stone artifacts that spread in the cave court and kitchen waste in the form of mollusk shells deposited near the entrance of Leang Petta Kere Cave is at an astronomical position of 458'43.2" LS and 1194'34.32" BT with a height of 85 m above sea level. Cave type belongs to the burly category characterized by the number of cavities with high ceilings. The cave facing northeast has a height of 8 m with a width of 24 m. On the ceiling there is an archaeological heritage in the form of images of animals and palms to elbows. The whole red, in addition, was also found jagged arrow-eye artifacts and kitchen waste in the form of a deposited mollusk shell.

**Keywords:***Ancient gardens, rock masses, caves, archaeology, stocky.*

# Preliminary Shear Wave Velocity Profiling Analysis for Site Classification of Tadulako University Using Microtremor Measurements

Mauludin Kurniawan[1], IchaUntari Meidji[2*], Nurhayati Pimpilemba[3], Hendrik Leopatty[3],

Harsano Jayadi[4,5]

[1]*Geophysical Engineering Study Program, Tadulako University, Indonesia*
*2Physics Study Program, Tadulako University, Indonesia*
*3Agency for Meteorology, Climatology and Geophysics (BMKG) class 1 Palu, Indonesia*
*[4]Geology Engineering Study Program, Tadulako University, Indonesia*
*[5]Doctoral Program of Physics Department, InstitutTeknologiSepuluhNopember, Surabaya*

*\*Corresponding author's:ichauntarimeiji10@gmail.com*

## Abstract

Microtremor is harmonic vibration of land that occurs continuosly at a low frequency. In this paper presents the analysis of shear wave velocity profile to interpret site classification at Universitas Tadulako. The data acquisition was done at 24 points by using microtremor single station method. The data was processed using Horizontal to Vertical Spectral Ratio (HVSR) method to obtain the HVSR curve and then inverted using ellipticity curve method to get 1D shear wave velocity profile. The value of shear wave velocity profile used to interpret subsurface layers to classification of the site. The result shows the range value of shear wave velocity profile is 286 m/s to 866 m/s. This value show that site classification in research area consists of rigid soils, very dense soils, soft rocks and rocks. These results indicate that the study area in general experiences a large potential for damage if an earthquake occurs. This research is expected to be a reference for the spatial layout of Universitas Tadulako.

**Keywords:***Shear wave velocity, microtremor, site classification*

# Tectonic features beneath Bali and Nusa Tenggara islands revealed from seismic tomography of P-wave: a preliminary result

M Ramdhan[1*], M F Nugraha[1], B Pranata[1], B S Prayitno[1], P Supendi[1], R Kusnandar[1], Wandono[2], M LHakim[1]

[1]*The Indonesian Agency for Meteorology, Climatology, and Geophysics (BMKG),Jl. Angkasa I, No.2 Kemayoran, Jakarta 10720*

[2]*High School for Meteorology, Climatology, and Geophysics (STMKG),Jl. Perhubungan I, No. 5,Pondok Betung, Tangerang Selatan, Banten 15221*

[*]*E-mail:mramdhan123@gmail.com*

## Abstract

Bali and Nusa Tenggara have complex tectonic settings in Indonesia. Seismic activities in that area are affected by the subduction zone, the Flores back-arc thrust, local faults, and volcanic activities. In this study, we show tectonic features in that area from horizontal and vertical sections revealed from seismic tomography of P-wave. Relocated BMKG earthquake catalog in that area is utilized to compute seismic tomography. Our seismic data resolution is limited at a depth shallower than 150 km. The results show tectonic features could be seen clearly in vertical sections passing Agung, Rinjani, and Kelimutu volcanoes. All tectonic features in three vertical sections are associated with the subduction zone (high velocity), magma supplying from the partial melting zone (low velocity), and the Flores back-arc thrust (high velocity). Three vertical sections show all partial melting zone occurs at a depth more than 100 km. This study is beneficial for earthquake disaster mitigation especially in updating slab lines in that area.

**Keywords:***Bali, Nusa Tenggara, Tectonic, Seismic, Tomography*

# JAVA MODULES FOR ELECTRONIC STRUCTURE CALCULATIONS USING DENSITY FUNCTIONAL THEORY AND PLANE WAVE

Agung Danu Wijaya[1*] and Darmawati Darwis[1*]

[1]*Tadulako University,*

*[*]Corresponding author's: <u>wijayadanuagung@gmail.comdarmadarwis@yahoo.com</u>*

## Abstract

In the calculation of the electronic structure consisting of many atoms withKSDFTmethod, must be done using multiple computers (parallel computing). But collectingmultiple computers in one placewhich requires a large amount of funds. This can be overcome byshare work across multiple computers in different locations and on different networksdifferent. Java language programs have a lot of support for doingcommunication between computers on different networks, but in terms of performancejava programming language is not as fast as Fortran. This can be overcome byusing Fortran, C or C++ at the calculation points that makehigh demand computing. In this study we have made the application ofthe beginning of the calculation of the electronic structure of the Si crystal withJava programs. The result of energy calculation of Si crystal with modulejava is different 0.0000125 Rydberg with Quantum Espresso Program.

**Keywords:***KSDFT, Java, Quantum Espresso.*

# Screening and identification of thermophilic uricase bacteria from the Mata Umpana Hot Spring, Buton Regency, Southeast Sulawesi

Sarni[1,2], Hasnah Natsir[1], Nursiah La Nafie[1], Abdul Wahid Wahab[1]

*[1]Chemistry Department, Hasanuddin University*

*[2]Pharmacy Department, Baubau Polytechnic*
*[*]E-mail:sarni.230579@gmail.com*

## Abstract

Uricase enzyme (urate oxidase EC 1.7.3.3) is a therapeutic enzyme, an oxidoreductase enzyme that plays a role in nitrogen metabolism and it's a specific catalyst for uric acid in the formation of allantoin compounds. Allantoin is a compound that can dissolve in water easily. This uricase can be produced in all organisms including bacteria, fungi, plants and animals except humans. This study aims to screen and identificate bacteria that produce urikase enzymes from Mata Umpana hot springs and determine the fermentation time for uricase production. Screening is based on the size of the clear zone or uricolytic index of bacteria growing on a medium containing 0.2% uric acid substrate, then the bacteria are identified morphologically and physiologically and then uricase enzyme production is performed. The results of microorganism screening from Mata Umpana hot springs obtained 57 bacterial isolates, and 50 isolates of them had uricolytic activity on 0.2% uric acid substrate with an incubation temperature of 45°C for four days. From the results of this study, 4 (four) bacterial isolates had a high Urikolytic Index (IU),IU> 1.5, which were identified from the morphological and physiological characteristics of the four bacteria, namely Isolate W.IA-6; W.IIIA-2.1; W.IVS-3 and W.IVS-7 have similar characteristics with the types of bacteria Enterobacter agglomerans, Alkaligenes faecalis, Bacillus alvei and Lactobacillus delbruscii. The results of uricase production from the four isolates were obtained: 1). isolate W.IA-6 had activity 0.3296 U/mL during 18 hours of fermentation; 2) isolate W.IIIA-2.1 had an activity of 0.4772 U/mL during 18 hours of fermentation; 3) isolate W.IVS-3 with activity 0.3702 U/mL at 12 hours of fermentation; and 4) isolate W.IVS-7 with an activity of 0.6897 U/mL during a 24-hour fermentation time.

**Keywords:***uric acid, activity, uricase,Thermophilic Bacteria.*

# Subsurface Identification of Landslide Using Geo-electrical Method in Karang Joang, East Kalimantan

Rahmania[1*], Febrian Dedi Sastrawan[1], Meidi Arisalwadi[1]

[1]*Physics Department, Kalimantan Institute of Technology, Balikpapan, Indonesia*

[*]*E-mail: [rahmania19@lecturer.itk.ac.id](mailto:rahmania19@lecturer.itk.ac.id)*

## Abstract

Karang Joang, Balikpapan, East Kalimantan is a high level vulnerability to occur landslide. This disaster can cause material and human losses. Based on its potential and the impact, we considered to carry out various preventions. One of them is conducting subsurface study to determine trigger factors of landslides. The existence of sliding plane is the most influential factors, because generally the incident moves above the plane. This research was conducted to study the subsurface layers and its conditions that may trigger the landslide based on resistivity properties. Geoelectrical method of Wenner-arrays ware applied in three areas around the landslide, by trajectory lengths 150m and minimum electrode space is 10m. 2D resistivity results indicate the subsurface area composed of soft clay by water saturated (0,99-10,8ohm-m), clays by low consistency (10,8-52,8 ohm-m), and clays by medium consistency (52,8-300 ohm-m) with maximum penetration depth is 24m. The trigger factors controlling the landslides are subsurface soil structures dominated by clays, different levels of clays consistency and fluid content. The soft clays identified in 5-16m depth is estimated to be a sliding plane of landslides. This research gives important roles for local societies and government to devolve the construction plan in the future.

**Keywords:** *Landslide, Wenner-arrays, Soft clay, Sliding-plane.*

# Noise Level Analysis Using the Noise Level Distribution Pattern Approach in the Masomba Market and Manonda Market, Palu, During the Covid-19 Pandemic

H M D Labania[1*], Kasman[1], A D Wijaya[1], Badaruddin[1], E T Maharani, E Salim[1]

[1]*Departement of Physics, Faculty of Mathematics and Natural Sciences, Tadulako University, Palu*

[*]*E-mail:elinlabania@gmail.com*

## Abstract

Research has been carried out by analyzing noise levels through the approach to the distribution pattern of noise levels in Masomba Market and Manonda Market, Palu. This study aims to find out how the noise level in the Masomba Market and Manonda Market Palu and surrounding areas was during the Covid-19 pandemic, as well as to obtain the distribution pattern of noise levels in the two locations. The equipment used for measuring the noise level is the Sound Level Meter. Data were collected at 16 points around Masomba Market and 20 points around Manonda Market. Measurements were taken at a distance of 3 meters from the walls of the market building and its surroundings as well as 4 points inside the market. Data processing is carried out based on time categories, namely L_morning, L_day and L_afternoon. Based on the results of measurements and data processing, the highest noise intensity value was obtained at the Masomba Market location of 74.92 dB(A) and at Manonda Market of 80.92 dB(A). From these results, it shows that the measurement of noise intensity during the Covid-19 pandemic still exceeds the noise threshold value, which is greater than 70 dB. This value is still in the category that can be accepted by human hearing as long as the exposure time is shorter. The source of the noise mostly comes from the sound of passing vehicles and the milling machine for kitchen raw materials.

**Keywords:***market noise intensity, sound level meter, covid-19 pandemic.*

# Synthesis of Hematite (Fe₂O₃) Nanoparticles Based on Iron Sand, Talaga Village, Dampelas District Using Precipitation Method and its Application as Nanocatalyst

Lufsyi Mahmudin[1], Riska Noprianti[1], Sabhan[1*]

*[1]Physics Department, Mathematics and Natural Science Faculty, Tadulako University, Palu, Indonesia*

*[*)]E-mail: sbh_ikl@yahoo.com*

## Abstract

Research has been conducted to synthesize $Fe_2O_3$ hematite nanoparticles based on iron sand originating from Talaga Village, Dampelas District, Donggala Regency. This study aims to produce hematite nanoparticles, analyze their physical and optical properties, and apply them as nanocatalysts. The manufacture of hematite ($Fe_2O_3$) nanoparticles using the precipitation method. After performing the precipitation method, the results of the synthesis were then characterized using XRD. The sample extraction process uses permanent magnets. Iron sand dissolved in HCL (12 M) and NH4OH (25%) was then heated at a temperature of 120ºC for 19 hours and calcined at a temperature of 800ºC for 2 hours. Initial test results with XRF showed that the hematite content of the sample was 90.05%. The XRD results show that the crystal system is in the form of hexagonal axes that have been matched using search match software with a crystal size of $(9\pm5)$ nm, while based on the results of UV-Vis analysis, it is found that hematite ($Fe_2O_3$) nanoparticles have one absorption peak which is not much different between sample A and sample B. Based on the study results, hematite ($Fe_2O_3$) nanoparticles have a stable absorption peak at a wavelength of 230 – 400 nm.

**Keywords:** *iron sand, hematite nanoparticles, Talaga Village*

# Filter of Composite Ore Manganese and Activated Carbon Coconut shell for Water Purification

Rosliana Eso[1*]

*[1]Department of Physics Education, Faculty of Education and Teacher Training ,UniversitasHalu Oleo, Indonesia*

*[*]E-mail:rosliana.eso@uho.ac.id*

## Abstract

This study investigates the effectiveness of a filter made from a composite of ore manganese and granular activated carbon of coconut shells to remove iron and manganese from groundwater. At the first stage of research, ore manganese and activated carbon were sieved, then, the composite was performed in comparison 20: 60 mess, 20:100 mess, 60:60 mess, and 100:60 mess of ore manganese and activated carbon. These composites were tested infiltration processes to remove iron from groundwater and the effectiveness of iron removal were achieving 94,05% sizing in 100:60 mess. With using particle size of 100 mess manganese and 60 mess of activated carbon coconut, the composite was performed by mass comparison of ore manganese and activated carbon with combination 25:75, 40:60, 50:50, 40:60, and 75:25. The effectiveness of manganese removal ranges from 74,16 % to 84,5 % and iron removal range from 76,31% to 88,73%, along with the increase in the amount of manganese concentration in the composite. The morphology of manganese was measured by using SEM-EDX, range from diameter 1,061$\square$m to 1.07 mm, and activated carbon range from 1,306 $\square$m to 55,020 $\square$m.

**Keywords:***water purification, ore manganese, activated carbon of coconut shell.*

# The Study of Phosphate Using Ferryhydrite as Binding Layer With Diffusive Gradient in Thin Films Method

Husain Sosidi[1], Khairuddin[1*]

[1]*Department of Chemistry Faculty of Mathematics and Natural Sciences Tadulako University*

[*]*E-mail:kjunus24@gmail.com*

## Abstract

Excess phosphate in the waters causes algal blooms which are indicators of aquatic eutrophication and consequently will reduce the oxygen concentration below the surface of the waters, causing algae blooms to the death of aquatic biota. Diffusive gradient in thin films (DGT) technique is one of the in-situ measurement methods developed for the measurement of phosphate in various environments and can be used for time-specific monitoring depending on the analyte and binding capacity of the binder phase. This research consisted of several steps: synthesis of polyacrylamide gel and ferrihydrite analyte binding layer gel. Acrylamide polymer was successfully synthesized with 15% acrylamide composition; N-N'-methylenebisacrylamide 0.5% and ferrihydrite as a gel binder of $Fe(NO_3)_3.9H_2O$ through titration with NaOH at pH 6.75. The polyacrylamide gel and ferrihydrite gel were cut into molds with a diameter of d=2.5 cm and arranged with a 0.45 m filter membrane on the DGT probe. Analysis of the effect of pH was carried out through a phosphate solution test with variations in pH of 3, 5, 7 and 9 for 4 hours then the ferrihydrite gel was eluted using 0.25 M $H_2SO_4$. The results of the analysis of the effect of pH showed high phosphate adsorption in the test solution with a pH of 3 to 7.

**Keywords:***DGT, phosphate, polyacrylamide, ferrihydrite.*

# Desorption β- carotene of Crude Palm Oil (CPO) from Clay Usingn-hexane

Syamsuddin[1*], Jusman[1*] and Alfin[1*]

*Tadulako University*

[*]*Corresponding author's:*
*syamsuddin_palu69@yahoo.comjusman_palu04@yahoo.comalfin@yahoo.com*

## Abstract

Beta carotene is a pro vitamin A which is good for the body. One of the plants that contain high beta carotene is palm oil (crude palm oil). This research was conducted for the desorption of beta carotene which is in clay adsorbent where the adsorbent has adsorbed beta carotene which is in palm oil. This study used a mixed solvent of n-hexane, acetone, and ethanol with a ratio of 2: 1: 1 with a ratio between the mixed solvent and clay (1: 2, 1:5, 1:10, and 1:20). Beta carotene levels obtained were measured using a UV-vis spectrophotometer with a wavelength of 450 nm. And the best results were obtained in a ratio of 1: 10 with levels of 9.34 x 10-6 M. The characteristics of beta carotene obtained were brownish orange.

**Keywords:**beta carotene, clay, desorption.

# Review of Low-level Wind Shear: Detection and Prediction

Muhammad Ryan[1,2], Adhi Harmoko Saputro[1], and Ardhasena Sopaheluwakan[2]

*[1]Department of Physics, Faculty of Mathematics and Sciences, Universitas Indonesia, Depok16424,Indonesia*

*[2]Agency for Meteorology, Climatology and Geophysics, Jakarta 10720, Indonesia*

*[*]E-mail:muhammad.ryan03@ui.ac.idadh@sci.ui.ac.iardhasena@gmail.com*

## Abstract

This article summarizes the development of research related to Low-Level Wind Shear (LLWS), especially regarding its detection and prediction. Wind Shear, especially LLWS, is one of the factors causing aircraft accidents due to weather. LLWS can occur naturally in nature without a cause and can also be caused by various factors. To avoid the bad impact of LLWS, various instruments were developed to detect it. Those are Low-level Wind Shear Alert System (LLWAS), Sound Wave Detection and Ranging (SODAR), Doppler Radar, Terminal Doppler Weather Radar (TDWR), and Light Detection and Ranging (LIDAR). These instruments have various advantages and disadvantages, respectively, so that the installation of the equipment at the airport must take into account the condition of the runway and the characteristics of the weather on the site. The next step further than detecting is predicting. This is because with predicting the LLWS event, pilots of the aircraft can know the location of LLWS will happen potentially so they can avoid that location. In general, the approach used to predict LLWS is to use a numerical model and a Machine Learning (ML) model. They too have their own pros and cons.

**Keywords:***Low-level Wind Shear, Wind Shear, LLWS detection, LLWS prediction*

# Biosynthesis of Silver Nanoparticles using Lannea coromandelica Bark Extract: Comparative Study with Polyvinyl Alcohol (PVA) and Polyacrylic Acid (PAA) as Stabilizing Agents

Abdul Wahid Wahab[1*], Abdul Karim[1], Nursiah La Nafie[1], Triana Febrianti[1],Nuritasari Azis[1]

*Chemistry Department, Hasanuddin University*

*E-mail:wahidwhb@yahoo.com*

## Abstract

Lannea coromandelica bark was one of the plants that has many functions as traditional medicine. This plant contains chemical compounds such as dihydroflavonols, reducing sugars, alkaloids, steroids, terpenoids, tannins, carbohydrates and flavonoids. These chemical compounds have the potential as bioreductants in the synthesis of silver nanoparticles (AgNPs). In this study, the biosynthesis and characterization of AgNPs was carried out using extract of Lannea coromandelica, as well as a comparison of the use of PVA and PAA stabilizers. The results showed that qualitatively the silver nanoparticles formed based on UV-Vis spectroscopy measurements obtained a maximum wavelength of 445 nm and an absorbance of 1.631. While the maximum wavelength is 446 nm for PVA-AgNPs with an absorbance of 1.856 and a maximum wavelength of 459 nm for PAA-AgNPs with an absorbance of 0.860. Furthermore, FTIR analysis was carried out to identify the chemical changes of the functional groups involved in bioreduction, and XRD characterization was carried out to see the particle size and confirm that the resulting pure silver nanoparticles were produced.

**Keywords:***biosynthesis, silver nanoparticles (AgNPs), Lannea coromandelica barkextract,PVA, PAA.*

# Study of Cadmium Adsorption Using Nata De Coco Cellulose Modified Diethylentriamine

Khairuddin[1*], Musdalifa[1], Mustika[1]

*[1] Department of Chemistry Faculty of Mathematics and Natural Sciences Tadulako University*

*\*E-mail:kjunus24@gmail.com*

## Abstract

Cadmium metal is one of the metals in aquatic systems found both as free ions and in complex form with dissolved organic matter. This metal is important to be monitored in aquatic systems because it is easy to become toxic at levels 10-50 of the normal concentration required for the growth of aquatic organisms and biota. The continuous increase in cadmium metal levels in water will cause pollution. Variations of metal species have been identified in natural waters including organic and inorganic species forms and are highly dependent on metal concentration, and pH. Research has been carried out on the effect of pH and concentration on the adsorption of cadmium metal ions (Cd2+) using nata de coco cellulose and diethylenetriamine-modified nata de coco cellulose.. Data of the isolation of nata de coco cellulose and the results of its modification were characterized by FTIR. The results of the analysis showed that the cellulose-diethylenetriamine adsorbent was optimally adsorbed at pH 6 with a concentration of 149.92 mg/L compared to nata de coco cellulose adsorbent at the same pH with a concentration of 101.18 mg/L while the results of the effect of concentration variations using nata de coco cellulose were obtained 133.65 mg/L and with nata de coco-diethylenetriamine cellulose as adsorbent obtained 142.35 mg/L with the initial concentration of metal ions Cd2+ 150 mg/L respectively.

**Keywords:**<em>Cellulose nata de coco, cellulose-diethylenetriamine, Cd, pH variation, concentration variation.</em>

# Seismicity of South Sulawesi Based on b Value and Its SeismicPotential

## Suharna. A[1], EkoHadi Sujiono[1], Pariabti Palloan[1]

*[1]State University of Makassar*

*[\*]E-mail:suharnaamir@gmail.com*

## Abstract

South Sulawesi is one of the provinces in Indonesia that has a high level of earthquake vulnerability. Being around active fault zones such as Walanae Fault, Palu Koro Fault and Matano Fault is one of the causes of this condition. The seismic activity of a region can be analyzed based on tectonic parameters known as b value. The b value describes the local characteristics of a region based on the degree of fragility of its rocks. This study was conducted to analyze the value of b in South Sulawesi based on earthquake events from 1991-2020. Value analysis b value is done using the FMD (Frequency Magnitude Distribution) method in the ZMAP 7 software. The number of earthquakes analyzed was 120 events of magnitude 3.0-7.0 obtained from the IRIS catalogue. Based on the distribution of earthquake events, South Sulawesi is dominated by moderate earthquakes with magnitudes of 4.0-5.0. The b value of South Sulawesi in general is $1.28 \pm 0.17$. The b value is quite high which is associated with the stress condition of a low region. This suggests that South Sulawesi in general will often face potential earthquakes with magnitudes less than 5.0, although at any given time earthquakes with larger magnitudes may occur. South Sulawesi is composed of Volcano Camba Formation Unit, Walanae Formation, Basal Truation Unit, Lompobattang Volcano Unit and Alluvial Precipitate. The structure of these rock formations is very heterogeneous which causes differences in rocks in receiving pressure, so the ability of rocks in storing energy accumulation is different.

**Keywords:***b value , seismicity, earthquake*

# The Arduino-based Instrument for Energy Conservation Law

Elisa Sesa[1*], Moh. Dahlan Th. Musa[1], Anis Nismayanti[1], Badaruddin Badaruddin[1], M.Syahrul Ulum[1] and Darmawati Darwis[1]

[1]*Physics Department, Tadulako University, Palu, Indonesia*

*E-mail:elisa.sesa@uon.edu.au*

## Abstract

The instrument for physics experiment is an essential part for understanding the theoretical part. In this paper we have built an Arduino-based instrument for energy conservation law. There are four main steps in building this instrument. First, designing and building the mechanical part. Second, designing and building the electrical parts. Third, building the program to control and process the data. Finally, the process of testing and data collection. The instrument is work well with the low deviation value of 0.0005 – 0.003

**Keywords:***energy conservation law, Arduino, instrument.*

# Mangrove Health Tester: Arduino-based Mangrove Health Detection Innovation As The First Step In Mitigating The Tsunami Disaster In Palu City, Central Sulawesi

Rafiqa Wulandani[1], Dian Septiawati[2], Khofifah Indah PratiwiSyahrudin[3] and Moh. Iqbal[4*]

[1]*Department Physics, Faculty of Mathematics and Natural Sciences, Tadulako University,*
[2]*Department Public Health, Faculty of Public Heath, Tadulako University*
[3,4]*Department Biology, Faculty of Mathematics and Natural Sciences, Tadulako University*

[*]*E-mail:iqbalmoh89@gmail.com*

## Abstract

Mangrove has important role in ecosystem. However, the existence of the mangrove ecosystem is experiencing disruption, which affects the existence of mangroves. It is important to know the health of mangroves to determine further conservation steps. The research method by purposive random sampling to choose tree of mangrove and measure environmental factors like water salinity, pH levels and HUE valuesof leafs using the innovation of the mangrove health tester tool that take into account the size including large stem diameter, tree height, and the light intensity. The species of mangroves will taken to measurement in Rhyzophora spp. We take 5 location of mangrove ecosystem as our sample, for location 1 R=22.40 G=20.48 B=19.98 salinity=27.7‰ pH=7.16, location 2 R=17.52 G=15.95 B=16.15 salinity=29.71 pH=7.35, location 3 R=18.60 G=17 B=17.03 salinity=29.40‰ pH=7.93, location 4 R=21.33 G=19.17 B=19.02 salinity=28.75‰ pH=8.04, location 5 R=25.48 G=23.25 B=21.56 salinity=0‰ pH=8.04. Therefore, the salinity and pH levels effects the RGB levels of Mangrove leaves as shown in 5th location. The results of measurements of salinity, pH levels and RGB values of leaves linked as a result ofgeneralizing analysis of healthy mangroves.

**Keywords:***Enviroment factor, Mangrove, Mangrove Health Tester, Palu Bay, RGB.*

# Physical Characteristics of Donggala Limestone-basedHydroxyapatite

Darmawati Darwis[1*], Elisa Sesa[1] and Agung Danu Wijaya[1]

*[1]Centre for Organic Electronics Tadulako University*

*[*]E-mail:darmadarwis@yahoo.com*

## Abstract

This research includes the preparation, synthesis and characterization of hydroxyapatite from limestone in Donggala Regency, Central Sulawesi. The aim of the study is to produce hydrospatite with a high purity level to be used as a candidate material for medical applications such as bone graft replacement. HAp synthesis was carried out using the sol gel method from limestone as a HAp precursor with various parameters of synthesis temperature and stirring time. To determine the characteristics of hydroxyapatite, XRF, XRD, FTIR and SEM characterizations will be carried out. Initial XRF measurement data shows that limestone from Labuan Bajo Village, Banawa sub-district, Donggala district has a very high CaO main constituent compound of 98.6% which has the potential to be utilized as hydroxyapatite.

***Keywords:***hydroxyapatite, limestone, characterization

# Pine resin utilization as binding agent for densification of coconut shells and rice husks at various pressures

Adi Setiawan[1], Khairil[2], Nurmalita[1], Zainuddin Ginting[3]

*[1]Mechanical Engineering Department, Faculty of Engineering, UniversitasMalikussaleh, Bukit Indah, Muara Satu, 24352, Lhokseumawe, Indonesia*

*[2]Magister Program in Renewable Energy Engineering, Faculty of Engineering,Universitas Malikussaleh, Bukit Indah, Muara Satu, 24352, Lhokseumawe, Indonesia*

*[3]Chemical Engineering Department, Faculty of Engineering, UniversitasMalikussaleh, BukitIndah, Muara Satu, 24352, Lhokseumawe, Indonesia*

*[*]E-mail: adis@unimal.ac.id*

## Abstract

Biomass such as coconut shells and rice husks are potential source of raw material for briquettes as an alternative energy to replace fossil fuels. The use of binder in briquette production is mandatory when good strength dan durability is needed. However, the commonly use binder is edible and may cause conflict with food security issues. This study aims to examine the use of pine resin in coconut shells and rice husks densification process at the pressures of $1\times105$ gr/cm2, $1.5\times105$ gr/cm2, and $2\times105$ gr/cm2. Prior to densification process, biomass raw materials were sun-dried, carbonized, grounded and sieved to mesh size-20. Next step was mixing bio-chars with binder, molding, drying, and testing the quality of the briquettes. Quality testing of the briquette includes calorific value analysis, proximate analysis to quantify water, fixed carbon, volatile matter, and ash content. Physical properties were find-out under a number of tests including compressive strength, density, porosity. The combustion tests were performed by direct combustion test as well as thermogravimetric analysis. The result shows that the highest calorific value is 9.352 cal/g, water content 5.4%, volatile matter 19%, ash content 11.2% with a burning rate of 0.0076 g/second. The best briquettes are briquettes made from a mixture of coconut shells and rice husks at a pressure of $2\times105$ gr/cm2 indicating a potential use of pine resin as non-edible natural resin.

**Keywords:***pine resin, Coconut shells, Rice husks, Bio-briquettes, Densification process*

# Geochronology of Geological Structure Lineation in the Palu-Koro Fault Zone

Muhammad Rusli M[1], Muh. Rusydi Hasanuddin[1], Faiz Alfayed[2]

*[1]Geophysical Engineering, Universitas Tadulako*

*[2]Physics Departmen, Universitas Tadulako*

*[*]E-mail: rusli8998@yahoo.com*

## Abstract

The Palu-Koro Fault Zone (ZPKF) is an active of strikeslip fault zone system that extends from north-northwest to south-southeast on the island of Sulawesi, Indonesia. The distribution of rocks in this ZPKF area consists of; The Wana Complex is Triassic, the Gumbasa Complex is Jurassic, the Latimojong Formation is Cretaceous, the Breakthrough Rock is Miocene, the Pakuli Formation is Pleistocene and Alluvial Deposits are Holocene. Fault Lineation is performed using DEM images. The lighting azimuth angles used are 0°, 45°, 90° and 135° using Global Mapper software. Structural Geological Analysis was carried out using PCI Geomatics and Stereonet devices. The fault direction at the Triassic age is NW – SE, the fault direction at the Jurassic age is NE – SW, the fault direction at the Cretaceous age is N – S, the fault direction at the Pleistocene age is N – S, the fault direction at the Holocene Triassic age is NW – SE. In general, the direction of the faults at various rock ages in the ZPKF follows the direction of the Palu Koro Fault as it is present.

**Keywords:** *Geochronology, Geology Structur, Lineation, ZPKF.*

# Water mass analysis in the Balikpapan Bay, East Kalimantan, Indonesia

I. Mandang[1*], M. Agustinus[2], Rahmiati[1], M. R. Putri[3], R. I. Wiyani[1], Z. Sihotang[4]

[1]*Oceanography Laboratory, Geophysics Study Program, Faculty of Mathematics and NaturalScience, Universitas Mulawarman, East Kalimantan, Indonesia*

[2]*Physics Study Program, Faculty of Mathematics and Natural Science, Universitas Mulawarman,East Kalimantan, Indonesia*

[3]*Oceanographic Research Group, Institut Teknologi Bandung, Bandung, Indonesia*

[4]*Earth Science Study Program, Faculty of Earth Science and Technology, Institut TeknologiBandung, Bandung, Indonesia*

[*]*E-mail: idris@fmipa.unmul.ac.id*

## Abstract

The waters of the Balikpapan bay include semi-closed bays where temperatures and salinity across the bay change. The goals of this research are to learn about the patterns of temperature spread and the state of water masses in the mixed layer area as seen through oceanographic measurements. As many as 26 sites participated in the field data retrieval. It was taken using a conductivity temperature depth from the head of the bay to the outlet of the bay (CTD). The salinity value range in front of the bay yielded a result of 33.569 PSU. Its volume had dropped to 27.069 PSU, while the salinity value had risen to 31.507 PSU near the bay's end. The temperature in the bay varies between 29.422 ° C and 29.422 ° C. The temperature rises to 31.286 ° C as the gang moves deeper into the bay. This concludes that the temperature in the shallower area is larger and that little changes occur from the surface to the maximum depth. The value of salinity is more reflected in the bay as a consequence of the prevalence of salinity, and the value of salinity is decreasing as a result of the influence of freshwater wastewater obtained from streams in the Balikpapan bay. It also has an impact on the water mass in Balikpapan Bay, which is becoming deeper and smaller.

**Keywords:***Balikpapan Bay, Water Masses, Density, Salinity, Temperature*

# Simulation of climate comfort index based on temperature humidity index for projection of climate comfort level around Makassar City during 2017-2099l

Sudirman[1], Fadlil Adzim[1], Yulian Yudha Pamungkas[1] and Rendy Septa Davi[1]

*[1]Meteorology, Climatology and Geophysics of Agency for Indonesia*

*[*]E-mail: sudirmansaknar@gmail.com*

## Abstract

There are so various climate comfort indices had developed such as Temperature Humidity Index (THI) at present . THI is a climate comfort index based on air and humidity conditions in an area. THI is one of the climate comfort indexes used for urban area development planning. Nowdays, the climate comfort index analysis has been conducted by using various methods such as THI. However, the analysis of climate comfort for the future is still rarely conduct. Considering of this matter, it is important to be conducted the study about a simulation of climate comfort index analysis for the future will be conducted by applying a climate projection approach around the Makassar area using projection data of Representative Concentration Pathways (RCP) . The purpose of this study is to identify the conditions of climate comfort levels from 2016 to 2099 period. The data used in this study are observations data of air temperature and relative humidity from Paotere Meteorological Station, Hasanuddin Meteorological Station and Maros Climatological Station as well as RCP 45 and RCP85 data in the form of air temperature that is obtain from Puslitbang (Pusat Penelitian dan Pengembangan BMKG/ BMKG's development and research centre ). Data period used from 1991-2015 for observation data while RCP data have period from 2016-2099 . The method used in this study is a method of simulating the level of climate comfort through a simple regression method approach.

This climate comfort level simulation approach method is done by reviewing the past climate comfort level using THI, then regressing with temperature data of RCP45 and RCP85 to project climate comfort conditions during 2016 - 2099. The results of the simulation projection of climate comfort level are conditions of climate comfort around the city of Makassar every 30 years will be an uncomfortable condition until 2099 based on the climate comfort index of THI.

# Ground Motion Characterization Based on Shear Wave Velocity in The Sigi Goverment Office Area.

Faiz Al Fayed[1], Muhammad Rusli Muin[2], Muhammad Rusydi[3], Aida Batalipu[4] and Hisashi Furuichi[5]

[1]*Physics, Faculty of Mathematics and Natural Sciences, Universitas Tadulako*

[2]*Geophysical Engineering, Faculty of Mathematics and Natural Sciences, Universitas Tadulako*

[3]*Geophysical Engineering, Faculty of Mathematics and Natural Sciences, Universitas Tadulako*

[4]*Japan International Cooperation Agency, Palu Representatives*

[5]*Japan International Cooperation Agency*

[*]*E-mail:* [faizalfayed07@gmail.com](faizalfayed07@gmail.com)

## Abstract

The Sigi Government Office Area is an area that suffered severe damage due to the 28th September 2018 earthquake. Seismic activity in this area can be caused by differences in soil characteristics and local site effect, making this location vulnerable to ground movements that cause damage. Ground motion characterisation can be based on the obtained value of shear wave velocity (Vs). This study aims to determine the characteristics of the ground motion at the site. This study used the Multichannel Analysis of Surface Waves (MASW) method to identify the shear wave velocity in 14 lines and 5 points of measurements. The results of this study indicate the value of Vs obtained is in the range of 139.7 – 586.9 m/s with soil categories C, D and E. This study concludes that the potential for ground motion increases with changes in soil categories from C, D to E. The highest potential of ground motion is in the centre of the study site, while the lowest potential of ground motions is in the southeastern part of the study site. The difference in the level of damage to buildings is associated with the location of the buildings in areas with different potential for ground motions..

**Keywords:***Ground Motions, MASW, Shear-Wave*

# Design of Concentrated Solar Thermal Powered Heat Exchanger Completed with Energy Storage Material

Shafira Riskina[1], Adi Setiawan[2], Gunawati[3], Muhammad Rafi Rajendra[2]

[1]*Magister Program in Renewable Energy Engineering, Faculty of Engineering,Universitas Malikussaleh, Bukit Indah, Muara Satu, 24352, Lhokseumawe, Indonesia*

[2]*Mechanical Engineering Department, Faculty of Engineering, Universitas Malikussaleh,Bukit Indah, Muara Satu, 24352, Lhokseumawe, Indonesia*

[3]*Department of Physics, Mathematics and Natural Sciences, Universitas Syiah Kuala,Darussalam, 23111, Banda Aceh, Indonesia*

[*]*E-mail: syahrul.ulum@untad.ac.id*

## Abstract

Indonesia is a tropical area and located under the equator line with more than six hours of sunlight a day or about 2400 hours a year. Solar energy has an intensity between 0.6-0.7 kW/m2 and has a potential of 207.8 GW. This potential can be utilized to reduce the use of fossil energy by harvesting solar energy and transfer it in a helical coil heat exchanger (HCHE) type This study aims to develop a special proposed heat exchanger design to collect solar thermal energy. As the energy supply is intermittent, a thermal energy storage system is installed. The design of HCHE has coil diameter of 10 mm with thickness of the tube 0.5 mm. HCHE performance test was performed by feeding water to the heat exchanger at a flow rate of 0.006 kg/s where the inlet water temperatures was 27.2˚C. At the outlet, the average temperature was 32.3˚C. During the test, the maximum temperature can be reached by the system was 269.4˚C. This indicates that the solar thermal collector design is working and potentially can be scale-up for energy generating system.

**Keywords:** *Solar thermal energy, heat exchanger, phase change materials, energy storage*

# Landslide Investigation Through Surface Geological Study and Photogrammetry Methods in Poi Area, Sigi Regency Central Celebes

Asrafil[1*], Muhammad Fuad Afdal[1*], Mauludin Kurniawan[2]

*[1]Geological Engineering Study Program, Tadulako University, Indonesia*

*[2]Geophysical Engineering Study Program, Tadulako University, Indonesia*

*[*]E-mail: asrafil@untad.ac.idmfuadafdal@gmail.com*

## Abstract

The earthquake that occurred on September 28, 2018 with a magnitude of 7.4 Mw with the location of the epicenter at 0.18 latitude and 119.85 east longitude and a distance of 26 km from North Donggala, Central Sulawesi, at a depth of 10 km (PuSGen, 2018) caused damage to the extraordinary areas of Donggala, Palu, Sigi and surrounding areas. The shock caused by the earthquake triggered landslide in Poi Village, South Dolo District, Sigi Regency, with large dimensions on the hillsides and resulted in the formation of piles of material and closed the water flow to the west of the Poi Village settlement (Geological Agency 2018). Investigations through surface geological studies and photogrammetry were carried out to identify surface geological conditions and potential landslide susceptibility in the study area. Based on the results of the geological review and analysis, it is known that the geology of the research area is composed of 3 rock units, namely the granite intrusion unit, the conglomerate unit and the alluvial deposit unit. The photogrammetry results show that the structural activity acting on the study area is proven by the presence of two shear faults with opposite displacement directions. The landslide control factor in the study area lies in the structural conditions, slope, and geohydrological conditions as well as the level of weathering that occurs in rocks in the study area. The movement of the soil mass in the study area that occurred previously left piles of landslide material with the potential to move down the slope.

**Keywords:***landslide, photogrammetry, poi village*

# Preliminary Result : Characteristics of Ambient Seismic Noise as A Source for Surface Wave Tomography in South Arm of Sulawesi and Its Surroundings

Wa Ode Awaliah[1*], Muh. Rusydi H[1], Sandra[1]

[1]*Department of Geophysical Engineering, Universitas Tadulako,Jl. Soekarno Hatta Km. 9, Palu 94118, Indonesia*

[*]*corresponding author's email : awaliah.lwaode@gmail.com*

## Abstract

Interstation cross correlations of ambient seismic noise from 1 year data in South Arm of Sulawesi and its surroundings has been studied. The objective of this study is to investigate the characteristics of the origin ambient seismic noise in these area. In here, we use stations located in South of Sulawesi, West of Sulawesi, and Southeast of Sulawesi who deployed by BMKG and GSN network as many as 11 stations. To evaluate the characteristic of ambient noise, we apply three scenario: based on seasonal variation, interstation distance, and stack of one year data. Our results show that the source of ambient noise is dominantly comesfrom Flores Sea and Makassar Strait when eastern season. This is thought to be related to primary microseism due to the interactions between the coastlines and the ocean floor. The best SNR quality is found at peak of period 10 – 20 s at interstation distance less than 100 km, whereas at peak of period 17 – 30 s the interstation distance is more than 100 km . Strong ambient noise emerges when using recordings that are stack of 1 year in duration. Next, our result applicable for the empirical Green's functions and ambient noise tomography.

**Keywords:***ambient seismic noise, surface wave tomography, South Arm of Sulawesi*

# Multivariate Profile Analysis to Identify Characteristics of Climate in Palu City, Indonesia

Lilies Handayani[1*], Rais[2], Fachruddin Hari Anggara Putera[3]

*[1]Statistics Department, Tadulako University, email: lilies.stath@gmail.com*

*[2]Statistics Department, Tadulako University, email: rais76_untad@yahoo.co.id*

*[3]Aquaculture Department, Tadulako University, email: fachruddinharianggaraputera@gmail.com*

*Corresponding author's e-mail address:* <u>*lilies.stath@gmail.com*</u>

## Abstract

Palu City is a tropical area with a Mediterranean climate, which is a climate characterized by hot during the dry season which occurs from April to September and wet during the rainy season from October to March. This study uses multivariate profile analysis to determine differences in climate characteristics of the city of Palu every month through parallelism, coincides, and similarity tests. The results obtained from this study are that the monthly climate profile in Palu City, Indonesia is parallel and coincides with the Willks'lamda statistical value of 0.1594 with the results of analysis of variance for each observation variable for rainfall (X1) of 0.0994, air temperature (X2) is 0.9998, air humidity (X3) is 0.6565, air pressure (X4) is 0.3648, wind speed (X5) is 0.5223, and solar radiation (X6) is 0.0820. Meanwhile, for the similarity test using the Pillai's Trace statistical value with a result of 0.1842 it was obtained that the climate profile was the same every month. So, it can be concluded that the climate characteristics of the Palu City, Indonesia each month do not have a significant difference.

**Keywords:***climate, coincides, multivariate profile analysis, parallelism, similarity*

# Analysis The Relationship Between Exports, Imports, BI Rate, Exchange Rate (USD/IDR), Money Supply (M2) and Indonesia's Foreign Exchange Reserves

Nur'eni[1*], Nurul Anisa[2], Lilies Handayani[3]

[1]*Statistics Department, Tadulako University, email: eniocy@yahoo.com*

[2]*Statistics Department, Tadulako University, email: nurulanisa.me@gmail.com*

[3]*Statistics Department, Tadulako University, email: lilies.stath@gmail.com*

*Corresponding author's e-mail address: nurulanisa.me@gmail.com*

## Abstract

The main source development in Indonesia is foreign exchange reserves which are national savings. Vector Error Correction Model (VECM) is a model which is used to analyze multivariate time series data which is not stationary at the level, but stationary at the first difference level and has cointegration. The purpose of this study is to analyze the relationship between exports, imports, BI rate, exchange rate (USD/IDR), money supply (M2) and Indonesia's foreign exchange reserves. The research using VECM indicate that there is cointegration and causality relationship. The results of this study obtained the VECM lag 1 estimation result in the short term shows the variable money supply (M2) which has a significant positive effect on foreign exchange reserves and in the long term shows the import variable and the money supply (M2) that has a significant positive effect on the export variable and the exchange rate (USD/IDR) has a significant negative effect on foreign exchange reserves. Forecasting Indonesia's foreign exchange reserves from January to December 2021 obtained the U-Theil value of 0,997988.

**Keywords:** *Foreign Exchange Reserves, Vector Error Correction Model (VECM), Forecasting, U-Theil*

# Repeated Use of Bromelain Immobilized on Alginate Membrane for Virgin Coconut Oil Production

J Hardi[1*], R A Putri[1], A Ridhay[1]

*[1]Chemistry Department, Tadulako University, Palu, Indonesia*

*[*]E-mail: jr.hardi0803@gmail.com*

## Abstract

The effectiveness of using the enzyme bromelain from pineapple hump can be increased through immobilization techniques. Bromelain immobilization was carried out by trapping method using an alginate matrix. This study aims to determine the effectiveness of repeated use of the bromelain enzyme that is immobilized by alginate matrix in the production of virgin coconut oil (VCO). Bromelain that was immobilized by alginate was used 5 times in the VCO production. The results showed that in the first and second use, the VCO yield was 30% and 33%, respectively. After the immobile enzyme was used 5 times, the VCO yield decreased to 17.83%. Based on the results obtained, the alginate immobilized bromelain enzyme can be used six times with an effectiveness >50%. The water content of VCO has met the APCC standards of 0.14%, while peroxide number and free fatty acid content are still quite high of 1.36 meq/kg and 0.4%, respectively. Physically, the obtained VCO has good quality until the third use of immobilized enzymes.

**Keywords:**Bromelain, immobilization, alginate, virgin coconut oil.

# Extraction properties of Cu(II) from aqueous solution with PVA/Alg cross-linked gel microcapsules immobilizing fine droplets of phenolic oxime extractant

Koichiro Shiomori[1], Nov Irmawati Inda[2], Shiro Kiyoyama[3],Takayuki Takei[4], Masahiro Yoshida[4], Hideki Matsune[1]

[1]*Depertment of Applied Chemistry, University of Miyazaki, 1-1 Gakuenkibanadai-nishi, Miyazaki889-2192, Japan*

[2]*Depertment of Chemistry, Tadulako University Jl. Soekarno Hatta Km.9, Kampus Bumi TadulakoTondo Palu, Indonesia*

[3]*Department of Chemical Science and Engineering, National Institute of Technology, MiyakonojoCollege, Miyakonojo 885-8567, Japan*

[4]*Department of Applied Chemistry and Chemical Engineering, Faculty of Engineering, KagoshimaUniversity, 1-21-40 Korimoto, Kagoshima 890-0065, Japan*

*Corresponding author's e-mail address: shiomori@cc.miyazaki-u.ac.jp*

## Abstract

Microencapsulation of extractants for metal ions, organic acids, amino acids and various compounds is one of the effective methods to overcome some disadvantages on the liquid-liquid extraction process, such as the difficulty in phase separation by the formation of stable emulsion or third phase between aqueous and organic phases, and use of a large amount of organic solvent. In this study, PVA/Alg-GA crosslinked-gel microcapsules immobilizing phenolic oxime extractant, 1-(2-hydroxy-5-nonylphenyl) ethanone oxime (LIX84-I) were by falling-drop method of O/W emulsion followed by crosslinking of Na-Alg by Ca2+ ion and crosslinking of PVA by glutaraldehyde. A lot of fine droplets of LIX84-I were successfully immobilized in the microcapsules. The contents of LIX84-I in the microcapsules increased with the added amounts of LIX84-I to the aqueous polymer solution. The maximum amounts of Cu(II) extracted in the microcapsules increased linearly with the LIX84-I contents with a slope of 1/2 which means two molecules of LIX84-I react with one Cu(II) ion. The extraction rate of Cu(II) into the microcapsules was analyzed using 2nd order reaction equation between the extractant and Cu(II) ion. The extraction rate was not significantly affected by the size of the extractant droplets dispersed in the microcapsules. The high durability of the microcapsules was confirmed by the repeated use for extraction and back-extraction of Cu(II).

**Keywords:***Gel microcapsules, Cu(II) extraction equilibrium, extraction kinetics, Phenolic oxime extractant,Alginic acid, PVA*

# Evaluation of surface dose in diagnostic radiology procedures

Jusmawati[1], R Rahmat[1], B Abdullah, D Tahir[1]

*[1]Departement of Physics, Faculty of Mathematics and Natural Sciences, Hasanuddin University, Tamalanrea-Makassar 90245 Indonesia*

*Corresponding author's e-mail address: dtahir@fmipa.unhas.ac.id*

## Abstract

Visualization techniques for the anatomical and physiological conditions of the organs of the human body using X-ray planes are used diagnostic procedures that are commonly in the medical physics. Since diagnostic procedures using radiation can have a negative effect to the patients, nuclear energy regulatory agency in Indonesia called BAPETEN has established a dosage guideline value for medical irradiation and requires that all X-ray plane used for conformance testing be performed to ensure that the output is still within specifications. In this connection, a study of radiation doses received by patients through entrance skin dose (ESD) values from the irradiation in the diagnostic radiology section has been conducted. The results are compared with the reference level issued by BAPETEN. The study was conducted by determining the ESD value of 180 exposure factors used for AP / PA, lateral thorax, and abdominal examinations for qualifying pediatric and adult patients in various hospitals, clinics, and practicing physicians who have radio-diagnostic service facilities. The results of this study show that the ESD value obtained is still below the dosage guideline set by BAPETEN and the ESD value of pediatric patients is lower than the adult patients ESD value.

**Keywords:**

# Impact Contrast Agent in Calculation Radiation for Therapy Planning: Study of Water Phantom

Jusmawang[1*], B Abdullah[1] and Dahlang Tahir[1]

[1]*Departement of Physics, Faculty of Mathematics and Natural Sciences, Hasanuddin University, Tamalanrea-Makassar 90245 Indonesia*

*\*Email: jusmawan9@gmail.com*

## Abstract

The Radiation Therapy Plan (treatment planning system) has been carried out on the CT Simulator image from Phantom with the addition of contrast agents 0%, 1%, 2%, and 3% on the object. In this study is to determine whether the presence of contrast agents in treatment provides an inaccurate dose representation during the calculation of radiation therapy doses. Contrast agents are used to increase contrast in low contrast images. The contas used are iopromide 370. The contrast agent is injected into identical balloons with a volume of 500 mL with different concentrations, namely 0%, 1%, 2%, and 3%. Each balloon was scanned in a water phantom measuring 30x30x30 cm3 with a volume of 25 L water using CT-Simulator. From each scan result a radiation therapy plan is made using eclipse TPS (Treatment Planning System) under the same conditions and techniques (SAD 100 cm, 10 cm deep). The overall data obtained shows that the presence of contrast agents influences the dosimetry produced by up to 3% when compared to identical non-contrast plans.

**Keywords:***Radiation Therapy Planning, Dose, Contrast agents, CT-Simulator, Balloon*

# Prediction of Changes in the Phreatic Level Using a Hydrogeological Approach in PostLiquifaction Disasters at the Petobo Area,Palu Groundwater Basin, Central Sulawesi Province

## Extraction properties

Zeffitni[*1]

*[12]Geology Engineering Department, Tadulako University, Palu, Indonesia*

*[*]Corresponding author's e-mail address:zefitni_04@yahoo.com*

## Abstract

The Palu, Sigi and Donggala earthquakes that occurred on September 28, 2018 caused enormous liquefaction along the fringe of the Palu valley, where alluvial fan deposits met the alluvial valley of the Palu River. Liquefaction occurs in the western part of the valley, namely in Balaroa and on the eastern side of the valley, namely Petobo, Lolu and JonoOge. The liquefaction that has occurred has caused changes in the phreatic level, especially in the Petobo and surrounding areas. This study aims to predict changes in the phreatic level past and post liquefaction. The research method is a hydrogeological approach to the characteristics of the phreatic level based on survey results and geospatial analysis. The results showed that there was a change in the phreatic level post liquefaction. From several observation points, the average change in phreatic level ranges from 0.5 meters to 1.0 meters from the ground surface. Changes in the phreatic level are caused by: 1). The Petobo area is located in an alluvial plain geomorphological unit with geolological formations generally alluvial, some of the Gumbasa complex and the Wana complex, with fairly high permeability, an average of 2 cm/day, and 2). Liquefaction avalanches in areas with a slope of < 4% have caused an increase in groundwater flow velocity and an increase in the phreatic level of 2.0 meters – 2.5 meters. Based on this, it can be concluded that in the Petobo area there has been a change in the phreatic level post liquefaction.

# Sustainable Groundwater Development Based on Characteristics of Aquifers in Phase IA PombewePermanentOccupancy at Sigi RegencyCentral Sulawesi Province

Ninasafitri[1] and Zeffitni[*2]

[1]*Environmental Engineering Department, Tadulako University, Palu, Indonesia*

[2]*Geology Engineering Department, Tadulako University, Palu, Indonesia*

[*]*Corresponding author's e-mail address:zefitni_04@yahoo.com*

## Abstract

Efforts to accelerate reconstruction after natural disasters 2018 in Central Sulawesi, especially in Palu City, Sigi and Donggala Regency, one of which is by building permanent occupancy. As apermanent occupancy, it is necessary to provide adequate fresh water facilities and infrastructure. This study aims to identify the potential of groundwater for fresh water needs in the permanent occupancy of Phase IA Pombewe, Sigi Regency based on the characteristics of the aquifer. The research method is a spatial and hydrogeological approach to aquifer characteristics based on survey results, analysis of pumping test data and laboratory tests on hydrochemical parameters. The results showed that the quantitative potential of groundwater based on well data SE-TW-132: permeability (K) 12.00 m/day, transsimivity (T) 527.00 m2/day, aquifer thickness 43.92 m, specific yield (Sy) 53.00%, discharge (Q) 15.00 l/sec, (Qs) 0.610 l/sec/m, Qmax 59.8 l/sec and Qopt 45, 79 l/sec. Spatially the distribution of the aquifer is in the form of denudational hills in the Pakuli formation with sand clay lithology. The results of the hydrochemical quality test for drinking water, namely good quality class with a distribution of measurement values, including: TDS 217.1 mg/l, pH 7.9, Fe 0.00 mg/l, Mn 0.00 mg/l, Cl 5.30 mg/l, SO4 8.60 mg/l, NO3 1.10 mg/l, and NO2 0.00 mg/l. Based on the results of data analysis, the characteristics of the aquifer in the permanent occupancyof Pombewe include productive aquifers. It can be concluded that sustainable groundwater development needs to be carried out at the permanent occupancyphase IA Pombewe, Sigi Regency. The sustainable groundwater development is based on the concept of groundwaterbasin (CAT) and groundwater management. The management principle is directed at a balance between conservation and utilization of groundwater which is integrated in policies and patterns of water resource management.

**Keywords:**aquifer, groundwater, permanent occupancy

# Earthquake Hazard Level in Mamuju district

Muhammad Rusydi[1], Rahmawati[2], Sandra[1]

[1]*Physics Department, Faculty of Mathematics and Natural Science, UniversitasTadulako, Palu, Indonesia;*

[2]*Geography Education Department, Faculty of Teacher Training and Education UniversitasTadulako, Palu, Indonesia*

*Corresponding author's e-mail address:rusydiutd@gmail.com*

## Abstract

An earthquake with a magnitude of 6.2 Mw on January 15, 2021, in West Sulawesi Province, has caused casualties and material losses. This incident also caused the connecting route between West Sulawesi and South Sulawesi to be cut off due to many landslide points. The impact of the Majene-Mamuju earthquake still leaves many problems, especially for people who have lost their homes. Considering that earthquakes are disasters with very long cycles, these disasters often occur so that when they occur, they often bring huge losses. A study was conducted on the level of earthquake hazard in Mamuju District. Therefore, this study aims to map earthquake-prone zones with a detailed scale. The study was conducted by measuring Vs30 using a microtremor on each rock sample using the HVSR method. Then these values were used as a reference in correcting the USGS Vs30 data, thus producing a VS30 distribution value. The results obtained showed that of the eight existing villages, seven villages showed a high hazard level, namely Tadui, Binanga, Karema, Mamunyu, bamboo, Batupannu, and Karampuang villages, and one town was at a low level of hazard, namely Rimuku village.

**Keywords:**

# The Effect of Scarification with Different Level of Sulphuric Acid on Seed Germination and Seedling Growth of *Indigofera zollingeriana* Miq

Marsetyo[1], N. Wahyuni[1], Tarsono[1], and I.W. Sulendre[1]

[1]*Department of Animal Science, TadulakoUniversity, Palu, Central Sulawesi, Indonesia*

*E-mail correspondence: marsetyomarsetyo@yahoo.co.uk*

## Abstract

Indigoferazollingeriana tree legume is now widely introduced in Central Sulawesi province for ruminant feed. The aim of this experiment was to determine the effect of different levels of sulphuric acid scarification on Indigofera zollingeriana's seed germination and seedling growth. A completely randomized design was used with 4 treatment and 6 replication. The treatment was scarification of seed with different levels of sulphuric acid namely 0, 86, 90, and 96%. Parameters measured include germination speed, percentage, hypocotyl, and shoot lengths. Germination speed and percentage, hypocotyl and shoot length were significantly ($P<0.05$) increased by the level of sulphuric acid scarification. The highest speed and percentage of germination was found on seed treated with 96% of sulphuric acid. The value of germination speed and percentage at sulphuric acid 0, 86, 90 and 96% was 4.22, 5.14, 6.35 and 7.23%/day and 24.22; 30.21; 54.37 and 76.28%, respectively. Moreover, the scarification of seed with increasing sulphuric acid concentration increased significantly ($P<0.05$) the hypocotyl and shoot length of Indigofera zollingeriana.The hypocotyl and shoot length of Indigofera zollingeriana treated with sulphuric acid at level 0, 86, 90 and 96% was 5.52, 6.18, 6.52 and 7.54 cm, and 1.71, 2.42, 3.06 and 3.82%, respectively. It was concluded that scarification with level of sulfuric acid 96% resulted in the highest germination performance and hypocotyl and shoot length of Indigofera zollingeriana.

**Keywords:***Indigofera, seed, sulphuric acid, scarification, germination*

# The Control Model of Yellow Rice Stem Borer (*Scirpophaga Incertulas Walker*) by Utilizing the Egg Parasitoid (*Telenomus Rowani Gahan*)

Saldi[1], Rina Ratianingsih[1*], Maulidyani Abu[1], and Agus Indra Jaya[1]

[1]*Mathematics Study Program, Tadulako University, Palu, Indonesia*

*\*Email :ratianingsihrina8@gmail.com*

## Abstract

Rice stem borer causes major damage to rice plants during its infancy, resulting indecreased qualityproduction of rice and crop failure. Yellow stem borer Scipophagaincertulas Walkeris one type of rice stem borer thatattacks rice plants. To prevent the decreased qualityproduction of rice and crop failure, the growth rate of rice stem borer must be control. In this research, the control is carried out by utilizing its naturalpredators by using egg parasitoids of the Telenomusrowani Gahan.Therefore, it is necessary to study based on the Mathematical Model to representthe spread of pests so that control can be carried out. From the MathematicalModel, it is obtained that the critical point is free from pests and endemic attacksby pests. The stability of the model is analyzedby using the Jacobian Matrix at thecritical point. The stability is guaranteed by the existence of the critical point, thatis, the egg laying rate parameter of the moth subpopulation. The simulation atthe critical point shows that the existence of egg parasitoids can reduce the growthrate and spread of the yellow rice stem borer so that it can reduce the number ofrice populations attacked by pests

**Keywords:**

# Effect of polystyrene microcapsules containing CaCl2 aqueous solution on mechanical strength and curing process of Portland cement mortar

Sukhbaatar Batchuluun[1], Kentaro Yasui[2], Hideki Matsune[2], Koichiro Shiomori[2], Ochirkhuyag Bayanjargal[3]

[1]*Department of Applied Chemistry, University of Miyazaki, 1-1 Gakuenkibanadai-nishi, Miyazaki 889-2192, Japan.*
[2]*Department of Urban Environmental Design and Engineering, National Institute of Technology, Kagoshima College, 1460-1 Shinko, Hayato-cho, Kirishima 899-5193, Japan*
[3]*Department of Chemical and Biological Engineering, School of engineering and applied sciences, National University of Mongolia, University Street-1, Ulaanbaatar-14201, Mongolia.*

*Corresponding author's e-mail address: shiomori@cc.miyazaki-u.ac.*

## Abstract

In order to apply microcapsules as a functional material of cement composites, such as self-healing and heat-transfer-controlling materials, the effect of the addition of microcapsules on the mechanical properties of cement mortar was investigated. Polystyrene microcapsules containing CaCl2 aqueous solution as a microencapsulation substance with monocore and multicore structures were successfully prepared from solid-inoil-in-water (S/O/W) emulsion by the solvent evaporation method. The compressive strengths of the mortars withand without the microcapsules were measured at various curing times. The compressive strength of the mortarwithout microcapsules increased with curing time. The compressive strength of the mortar with the microcapsuleswas lower than that without microcapsules and increased with time. The decrease in the compressive strengthincreased with the amount of the microcapsules added in the mortar. The self-healing effect of cracked mortar bythe CaCl2 which would be supplied from the microcapsules due to outer mechanical force making cracks in themortar and on the microcapsules was not observed in this experiment. However, permeation and leakage of Clion to the surrounding mortar from the microcapsules was observed by mapping analysis of SEM-EDX.

**Keywords**: *cement composite, microcapsules, compressive strength*,

# Bootstrap Aggregating on Logistic Regression To Labor Force Participation Rate

M Fajri[1*], Rais[1], I Rizaldi[1]

[1]*Statistics Study Program, Tadulako University, Indonesia*

*\*Email: fajrimohammad19@gmail.com*

## Abstract

The Labor Force Participation Rate (LFPR) is a certain population group which can be calculated from the comparison between the number of the workforce and the population of working age in the same group. The Labor Force Participation Rate in Central Sulawesi Province in 2018 was 69.52%, an increase if compared to the Labor Force Participation Rate in 2017 of 67.14%. The increase in Labor Force Participation Rate that cannot be maximized properly will result in an increase in the number of unemployed. This study aims to classify a person's working status in Central Sulawesi Province using the bootstrap aggregating (bagging) logistic regression method. Beside that, the aim also to compare the difference between the accuracy of logistic regression with the accuracy implementation of bootstrap aggregating (bagging) to the data. The results obtained show an increase in accuracy using bagging with 500 iterations. The values of accuracy, sensitivity and specificity obtained are 76.83, 95.21 and 41.91, respectively, which means there is a increase on the accuracy when bagging was used.

**Keywords** : *Bagging, Labor Force, Logistic Regression*

# Changes in Low Rank Coal Properties and Carbon Dioxide Absorbability

Afikah Rahim[1], Melanie Lim Ming Mei[1], Nur Firdaus[1], Nabiel Hamzah[1]

*[1]School of Civil Engineering, Faculty of Civil Engineering, UniversitiTeknologi Malaysia, Johor,Malaysia.*

*Corresponding author:afikahrahim@utm.my*

## Abstract

Carbon dioxide ($CO_2$) is the main greenhouse gas, hence reducing its emissions is very important. Capturing $CO_2$ discharged into the atmosphere and storing it in suitable disposal places such as coal strata is one method of reduction. The goal of $CO_2$ sorption research at the laboratory scale is to develop ECBM (Enhanced Coal Bed Methane Recovery) technologies that resolve $CO_2$ storage while increasing CBM exploitation efficiency. Because ECBM recovery relies on sorption for $CO_2$ sequestration, understanding the adsorption-desorption mechanism and sorption hysteresis is critical. This page discusses $CO_2$ storage in coal seams. Currently, substantial research is underway to investigate coal $CO_2$ sorption capacity. The efficacy of the contact depends on the $CO_2$ molecular characteristics and the external centres of coal matter. The main storage processes include absorption in micropores and surface meso- and macropores, and absorption in the coal porous system. In prior research, regulating parameters of $CO_2$ hysteresis for coal were studied. The following conditions were screened: sample condition, moisture, maximum pressure, and coal characteristics, including rank. These factors are dependent on the in-situ pressure and temperature conditions encountered in coal at sub- and supercritical temperatures (33.1 °C) and pressures (7.4 MPa), as well as moisture content. Also, calorific value has given important to the sorption value as its submitted to its polar group of the coal molecules of brown coal. Compaction of the coal matrix affects sorption kinetics. Based on laboratory observations, the combined effects of sub- and supercritical temperatures and subcritical pressures on dry and moist samples of coal were described. The mechanism of $CO_2$ sorption hysteresis has been examined, and a probable explanation for the impacts of the regulating factors has been provided, although more research is required.

# Rock Slope Stability Studies at Selinsing Gold Mine, Pahang

S.H. Osman[1], A. Rahim[2], H. Zabidi[3]

*[1] Fuel Cell Institute, UniversitiKebangsaan Malaysia, Bangi, Malaysia*
*[2]Dept. of Geotechnical and Transportation, UniversitiTeknologi Malaysia,Johor Bahru, Malaysia,*
*[3]School of Materials and Mineral Resources Engineering, Universiti Sains Malaysia, Penang,*
*Malaysia*

*\*Corresponding author E-mail:afikahrahim@utm.my*

## Abstract

Rock slope stability has a tendency to slide or failure. Rock mass classification system has been proposed to reduce the risk of failure. Hence, the aim of this research is to do the preliminary assessment of rock stability via the rock mass classification system. Rock Mass Rating (RMR) system and Geological Strength Index (GSI) system are two main classification systems that have been chosen for these researches. As to achieve the objectives, necessary of several methods is required. This research testing divided into two categories which are field investigation (geological mapping) and software analysis. Field investigation are being done by settling the information by collected, measured, observed and recorded such as RQD, discontinuity orientation, spacing and condition. Lastly, the data obtained been entered into the software analysis Dips Rocsciences Software to generate the stereographic projection. Based on the researches result, the summation of all the RMR system and GSI system will determine the type of rock class while software analysis responds to failure of slope.

# Computerised Tomography Application: Coal Integration between sorption to Carbon Dioxide

Afikah Rahim[1], Melanie Lim Ming Mei[1], Nur Firdaus[1], Nabiel Hamzah[1]

[1] *School of Civil Engineering, Faculty of Civil Engineering, UniversitiTeknologi Malaysia,*

*Johor,Malaysia.*

*Corresponding author:afikahrahim@utm.my*

## Abstract

Using dual-energy CT-scanning for reservoir rock evaluation is not a novel approach. It has been used for many years. Each time the rock is scanned with a different X-ray energy, the same region is scanned twice. In a 1987 paper, Wellington and Vinegar stated that scanning the sample at high (above 100 kV, Compton scattering dominant) and low (well below 100 kV, Photoelectric absorption dominant) X-ray energies can yield two images, one proportional to bulk density and the other proportional to atomic number. They created CT slices that showed differences in density and atomic number. In fluid flow visualization investigations, dual-energy scanning has been employed successfully. As well as a lack of adequate software and techniques to build bulk density and nuclear number pictures from high- and low-energy CT data, the difficulty is compounded by the lack of steps to use density and atomic number data for characterizing the cores. The density and atomic number images can now be generated from the dual-energy data using commercially available software. A number of strategies are described in this work to better characterize reservoir rocks using density and atomic number data. Small plug samples with known petrophysical parameters were first used to validate the process. A 60-foot-long segment of preserved core from an Upper Jurassic carbonate reservoir in Saudi Arabia was then CT-scanned at two distinct X-ray energies every five centimeters (2 inches). Qualitatively, the results were interesting and could help us better understand carbonates. To calculate porosity values using approximate mineral compositions, this document provides step-by-step directions in the form of diagrams.

# Deterioration and Defect in Concrete Bridge Structures : Alkali-Silica Reaction

Siti Noor Syuhaidah Hafizah Noor Azam[1], Muhammad Fakhrul Ikhmal Akashah[1], Afikah Rahim[1]

*[1]Department of Geotechnics & Transportation, School of Civil Engineering, Faculty of Engineering, Universiti Teknologi Malaysia, Malaysia.*

*Corresponding author's e-mail address: siti-96@graduate.utm.my*

## Abstract

The deterioration of reinforced concrete bridges due to environmental stressors is proven to adversely affect their strength and durability over time. This primarily originates from the penetration of aggressive ions at aggregate level, stimulating swelling and expansion of concrete materials that leading to the major concern of reinforcement corrosion due to the impact on load bearing capacity of the piles. In this paper, a literature review presenting a petrography analysis within crack formation of the concrete due to Alkali Silica Reaction (ASR). Due to its multiscale properties, SEM-EDS analysis was conducted as means of approach to study the microstructural properties of the samples. The aim of the review is latest advancement related to the ASR with exposure to saltwater. It is known the formation of ASR can lead to expansion of gel that leads to formation of crack. Thus, it is important to study the conditions that favourable to ASR on the pH, type of aggregates, optimal temperatures as plotting ways of elimination from the additional of admixtures. In reference to several experiments and finite models, it can be concluded that more in-depth studies are needed. Usually, the simulation model is using a simplified model, thus, a complete mechanism and properties is limited to be captured, and the application is constrained to the way the data is obtained. As this lack of knowledge leads to inability to assess risk, cost-effectively predict service life, andefficiently mitigate and forecast the extent of damage.

# Delayed Ettringite Formation in Marine Environment and Relationship with Sulphate Attack

Muhamad Fakhrul Ikhmal Akhshah[1], Siti Noor Syuhaidah Hafizah Noor Azam[1]
& Afikah Rahim[1]

**[1]**Department of Geotechnics & Transportation, School of Civil Engineering, Faculty of
Engineering UniversitiTeknologi Malaysia (UTM)

Corresponding author's e-mail address: muhamadfakhrulikhmal@graduate.utm.my

## Abstract

This paper shows a review regarding ettringite formation in marine environment that related by sulphate attack in exposed marine concrete structures. Ettringite formation is associated with the repelling and expansion of concrete structures. The early development of ettringite that occurs immediately (within hours) is the mechanism that governs stiffening that does not produce any harmful expansion and is associated with the time control of the Portland cement paste environment. In this process, ettringite is distributed in the cement paste evenly and discretely. However, in marine environment, this mechanism does not show any reaction but later after several exposed seasons will cause the harmful expansion, that usually been called as Delayed ettringite formation (DEF). Delayed ettringite formation (DEF) forms at late stages by forms cracking and spalling can be caused by out form expansion in hardened concrete. Depending on the source of sulphate, DEF may be examined: external and internal attack of sulphate. The study also shows that DEF might occurs at marine concrete structures but not associated with the sulfate attack but associated with chloride intrusion from seawater that causes the corrosion to the concrete structures. The presence of sodium chloride (NaCl) in seawater will accelerate the attack on other compounds on the concrete. Thus, the reaction of DEF not only associated with the presence of sulfate but also with another mechanism that can contribute to the cracking and spalling of concrete.

# Geological Hazards that Occured on September 28th, 2018 in Sirenja Sub-District Donggala Regency, Central Sulawesi Province, Indonesia

A Abdullah[2], A I Abdullah[1]*, F A Marhum[1], A Listianti[1], M Rusli[2], M D T Musa[2], A Rahman[2], I K Sulendra[3], S Sandra[2]

1) Geological Engineering Study Program, Tadulako University

2) Geophysical Engineering Study Program, Tadulako University

3) Civil Engineering Study Program, Tadulako University

*Corresponding author's e-mail address: ahmadimamabd999@untad.ac.id*

## Abstract

The location of the Mw 7.5 earthquake on September 28, 2018, was in the Sirenja District of Donggala Regency or about 75 km to the north of Palu City. Although this location is tens of kilometres away from Palu City and Sigi Regency in the south, it seems that these two areas have been studied more about the character and impact of the disaster from several published publications and reports. We present this paper, to complete information on disaster data in the northern part, especially for the Sirenja area as an epicenter location. The scope of this research is to present the types of geological hazards, including the area coverage that influenced. Starting with studying the geological conditions of the Sirenja area, then identifying and mapping the types of hazards that occur. Five types of geological hazards hit the Sirenja area at that time, namely due to surcafe rupture faults, earthquake shocks, liquefaction effects, tidal flood inundation and tsunami. Around the fault line, many buildings were damaged due to deformation of the soil, and this is the same as the impact of damage caused by liquefaction. In addition, the scale of the earthquake shock that reaches level VIII also has a severe impact on building damage, as well as a source of triggers for liquefaction which is spread over the alluvium plain which is defined as a groundwater basin. Meanwhile, around the coast, the tsunami and tidal floods have inundated several areas that are still happening today. Thus, September 28, 2018, is a time that marks the Sirenja area is prone to several geological hazards, and at any time or without knowing when a natural disaster like this will occur again. Based on the results of this study, the local government and the people of Sirenja District are expected to immediately relocate and make a risk reduction strategy or action plan, where the information from this paper can contribute to this.

# Synthesis of PVA/Na-alginate Polymeric Particles Impregnated with Banana Peels and Their Application for Copper(II) Removal

Natasya Fridian Aprilia[1], Dini Dwi Yunia[1], Veronika Pato[1], Abdul Rohim[1], Shara Aulia Ramadhani[1], Nov Irmawati Inda[1], Pasjan Satrimafitrah[1] and Koichiro Shiomori[2]

[1]*Department of Chemistry, Tadulako University, Jl. Soekarno Hatta Km.9, Kampus Bumi Tadulako Tondo Palu, Indonesia*
[2]*Depertment of Applied Chemistry, University of Miyazaki, 1-1 Gakuenkibanadai-nishi, Miyazaki 889- 2192, Japan*

*Corresponding author's e-mail address: nov_chemuh@yahoo.co.id*
*Pasjan82@gmail.com*

## Abstract

Environmental pollution has always been an interesting topic to discuss both at national and international levels because environmental pollution accelerates with the rapid development of industry in various parts of the world, especially environmental pollution caused by heavy metal such as copper(II). In this study, banana peels as an organic waste were impregnated into the PVA/Na-alginate polymeric particles through (O/W) emulsion process and crosslinked with calcium chloride (CaCl2), then used as a biosorbent in copper(II) removal process. The obtained polymeric particles without banana peels waste show white gel-like beads and dark brown for polymeric particles containing banana peels waste. The PVA/Na-alginate impregnated with banana peels polymeric particles worked well in copper(II) removal at pH 4 with extracted amount was 2,9181 ppm.

**Keywords:** *Polymeric particles, pva, alginate, banana peels, copper(ii)*

# Characteristics of Co-combustion of Low-Rank Coal Mixed with Cocoa Pod Husk

Daud Patabang[1*], Alimuddin Sam[2], Basri[3]

[1)2)3)] Department of Mechanical Engineering of Tadulako University, Palu Indonesia
*Corresponding author's e-mail address:* daudpatabang@gmail.com

## Abstract

CPH is one of the plantations wastes that have alternative fuel to mix with the LRC. This research was aimed to find out of thermochemical characteristics of the LRC-CPH mixture. The research method used is the experimental method, through mixing of LRC with the addition of CPH, the percentage addition of CPH into the LRC are 10%, 30%, and 50%, respectively. The mixture was then pressed with a pressure of 2.2 MPa in a briquette mold to obtain a mixture of LRC-CPH charcoal briquettes. The briquette samples were characterized to find out thermochemical properties by using proximate analysis, ultimate analysis methods, and testing of briquette combustion in a briquette stove using the water boiling method to determine thermal efficiency. The results of this study were presented the addition of CPH into the LRC is proven to improve combustion quality, there is a significant increase in combustion efficiency, and the optimal addition of CPH into the LRC is 30%. With the addition of 30%, the LRC combustion efficiency increased by 42.11%. In addition, there is a decrease in the content of S and N2, which has implications for the reduction of gas emissions from the combustion of SOx and NOx.

**Keywords**: Low-Rank Coal, Cocoa Pod Husk, Proximate Analysis, Ultimate analysis, Thermal efficiency.

# Preparation of Biochar from Ketapang Shells (Terminalia catappa L.) for Dyes Adsorbent to Support Environmental Principles

Mery Napitupulu[1*], Nurasyah Dewi[2], Daud K Walanda[1], Ega Riskiantari[1]

*1) 1Department of Chemistry Education, Tadulako University, Jl. Soekarno Hatta Km.9, Indonesia*
*2Department of Physic Education, Tadulako University, Jl. Soekarno Hatta Km.9, Indonesia*

*Corresponding author's e-mail address: merytn@gmail.com*

## Abstract

Environmental pollution has always been an interesting topic to discuss both at national and international levels because environmental pollution accelerates with the rapid development of industry in various parts of the world, especially environmental pollution caused by heavy metal such as copper(II). In this study, banana peels as an organic waste were impregnated into the PVA/Na-alginate polymeric particles through (O/W) emulsion process and crosslinked with calcium chloride (CaCl2), then used as a biosorbent in copper(II) removal process. The obtained polymeric particles without banana peels waste show white gel-like beads and dark brown for polymeric particles containing banana peels waste. The PVA/Na-alginate impregnated with banana peels polymeric particles worked well in copper(II) removal at pH 4 with extracted amount was 2,9181 ppm.

**Keywords:** *Polymeric particles, pva, alginate, banana peels, copper(ii)*

# Adsorption Biocharcoal from Shell and Fruit Stems of Palm in Removal Fe Ions

Daud K Walanda[1*], Mery Napitupulu[1], Dwijumia Dwijumia Purbawati[1]

*Department of Chemistry Education, Tadulako University, Jl. Soekarno Hatta Km.9, Indonesia*

*Corresponding author's e-mail address:* daudpatabang@gmail.com

## Abstract

This study aims to identify the adsorption of biocharcoal from oil palm shells and fruit bunches to Fe ions. The method used in this study is a laboratory experiment using oil palm shell biocharcoal and oil palm fruit bunches as adsorbents against Fe ions. The results obtained showed the optimum contact time for palm shell biocharcoal at a contact time of 90 minutes with a percentage of uptake to Fe ions of 97.61%, while the palm fruit bunch biocharcoal at 120 minutes where the rate up to 99.58%. The optimum weight of palm oil biocharcoal at 20 mg with a percentage of absorption Fe ions is 99.92%, while palm fruit bunch biocharcoal at 60 mg with a rate of Fe up to 68.30%. The optimum concentration obtained for the two biocharcoal is identical, at a concentration of 60 ppm with a percentage of Fe ions up to 99.30% for palm shells .In contrast, for palm fruit bunches, the percentage of absorption Fe ions is 98.91%. The maximum absorption capacity of palm shell biocharcoal is 123.45679 mg/g, and palm fruit bunches is 39.2157 mg/g  using the Langmuir isotherm equation. Meanwhile, the maximum absorption capacity of palm shell biocharcoal is 123.6801 mg/g and oil palm fruit bunches of 41.2287 mg/g using the Freundlich isotherm equation.

**Keywords**: *Biocharcoal, Shell, Stem, Palm, Adsorption, Iron*

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# Analysis of the changes power output and energy dose of green laser against OD and MDA values after photoinactivation to Candida albicans and Staphyloccocus epidermidis biofilms

Muhammad Zain[1], Sri Dewi Astuty[2*], Syamsir Dewang[2], Bidayatul Armynah[3], Syahrul Ramadhana[1], Rahmadan Rizki Wahyudi[1], and Enggrianti Engrianti[1]

*[1]Student of Physics Department, Mathematics and Science Faculty, Hasanuddin University.*
*[2]Optic and Spectroscopy Laboratory, Physics Department of FMIPA, Hasanuddin University.*
*[3]Electronics and Instrumentation Laboratory, Physics Department of FMIPA, Hasanuddin University.*

*Corresponding author's e-mail address:* daudpatabang@gmail.com

## Abstract

Many have research about successfully of PDT to killing the pathogenic microbe as Candida albicans and Staphyloccocus epidermidis using natural photosensitizer like chlorophyll. The principle of photoinactivation mechanism utilizes the activation process of sensitizer molecules by light so that an excitation process occurs and get some reactive compounds such as singlet oxygen. The absorption of a number of the photon energy of light which is called the radiation energy dose which depends on the power output of the light source over a certain period of time. This study aims to compare the effect of photoinactivation on the biofilm associate C. albicans and S. epidermidis with exposure 60 to 300 seconds. The light instrument had been designed to use a microcontroller with a green laser completed of the display unit of output power. The results showed that PDT treatment with green laser was able to reduce biofilm cells up to 42 % (D5 group) and 66% (PD5 group). The results of the MDA test showed that the highest value in the PD5 group was (0.388±0.004) nmol/mL. This indicates that the combination of two types of microbes that form a biofilm will have a different inactivation effect compared to single biofilm cells.