No:B/1823/UN19.5.1.3/PT.01.06/2021

Certificate

Presented to:

RIDHAWATI THAHIR

State Polytechnic of Ujung Pandang

as a Presenter entitled

"Prepare and Utilize Mesoporous Silica SBA-15 for Efficient Photocatalytic Adsorption of Methylene Blue and Copper (II)"

in Universitas Riau International Conference on Science and Environment- 2021 (URICSE-2021)

Institute of Research and Community Services
Universitas Riau

Pekanbaru, 11 September 2021

Head of Institute of Research and Community Services
Universitas Riau

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ON SCIENCE AND ENVIRONMENT 2021
(URICSE-2021)

Prepare and Utilize Mesoporous Silica SBA-15 for Efficient Photocatalytic Adsorption of Methylene Blue and Copper(II)

Pekanbaru - Indonesia, September 11, 2021

Organized by:
Institute of Research and Community Services, Universitas Riau

LPPM Universitas Riau
Meneliti, Berkarya dan Mengabdi

Prepare and Utilize Mesoporous Silica SBA-15 for Efficient Photocatalytic Adsorption of Methylene Blue and Copper(II)

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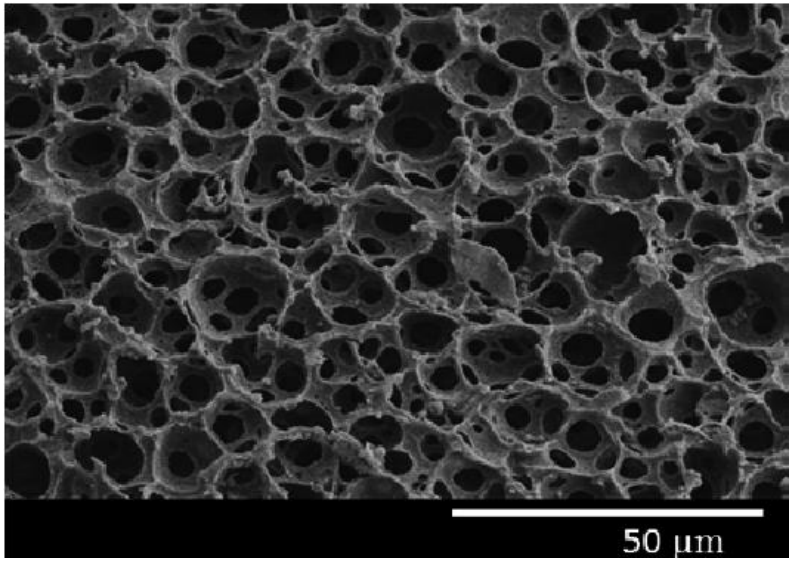
Porous materials have a porosity 0.2-0.95

Porous materials are a class of **materials** with low density, large specific surface and a range of novel properties in the physical, mechanical, thermal, and electrical

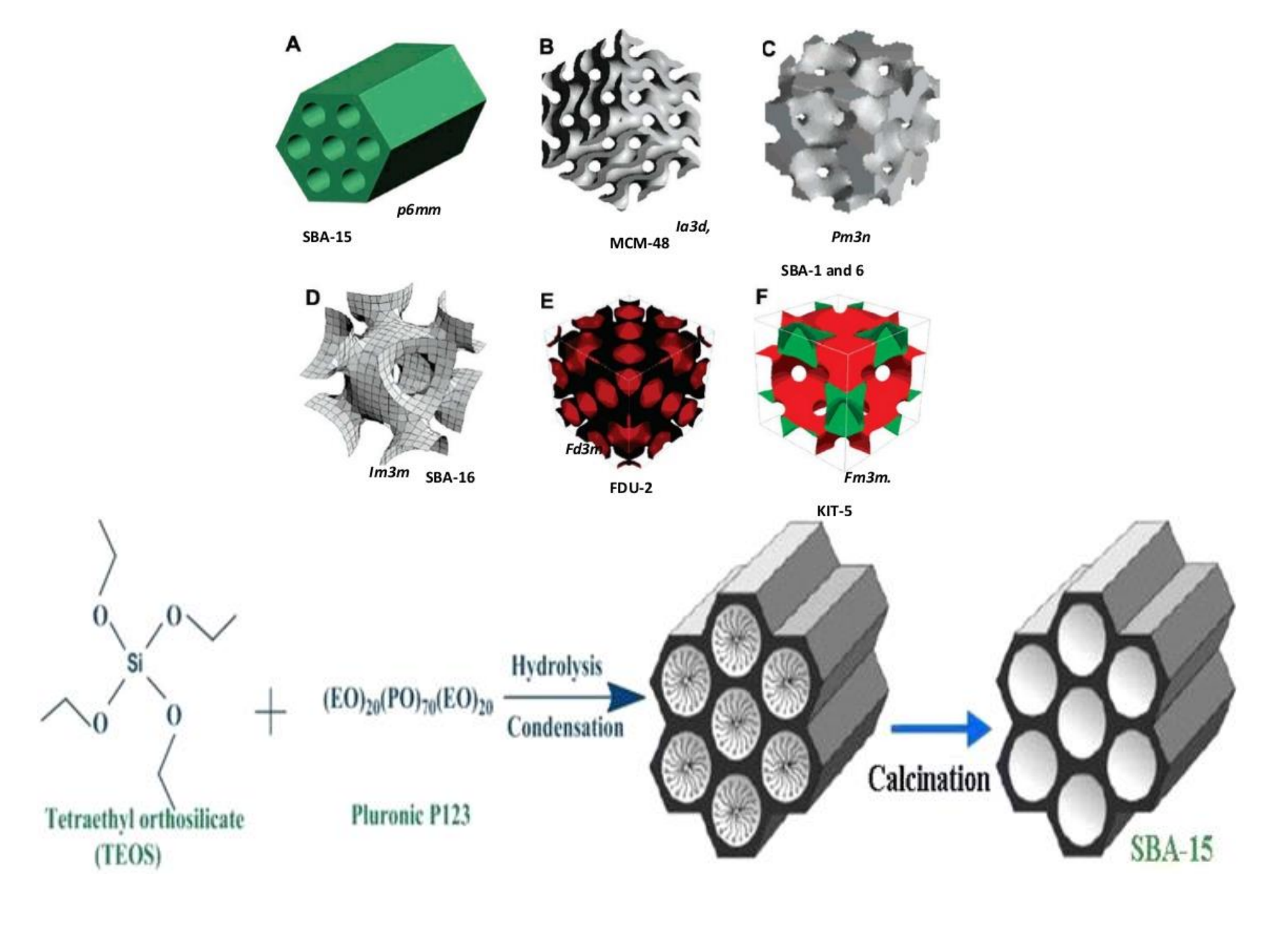


Porous materials by IUPAC classification

Microporous
(d_{pore} < 2 nm)

Mesoporous
(d_{pore} 2-50 nm)

Macroporous
(d_{pore} >50 nm)


A
p6mm
SBA-15
B
Ia3d,
MCM-48
C
Pm3n
SBA-1 and 6
D
Im3m
SBA-16
E
Fd3m
FDU-2
F
Fm3m.
KIT-5
Si
Tetraethyl orthosilicate
(TEOS)
(EO)20(PO)70(EO)20
Pluronic P123
Hydrolysis
Condensation
Calcination
SBA-15

Mesoporous silica SBA-15 have advanced structure properties,

- high specific surface area → active sites
- uniformity large pore diameter
- thick pore wall
- hydrothermal stability

Application mesoporous silica SBA-15

- catalysis
- water treatment
- sensor
- supporting cell for composite materials

Modify variable synthesis of SBA-15

(Junjiang Zhu et al, 2011) The addition of PVA, S_{BET} of SBA-15 is increased to 1248 m^2/g while the structure and pore size stable

(Junhong Wang et al, 2015) The amount of PVA during preparation → highly molecular sieve, with thick pore and high hydrothermal stability → produce better structural properties (S_{BET} = 687 m^2/g)

combination of the initial temperature and hydrothermal treatment

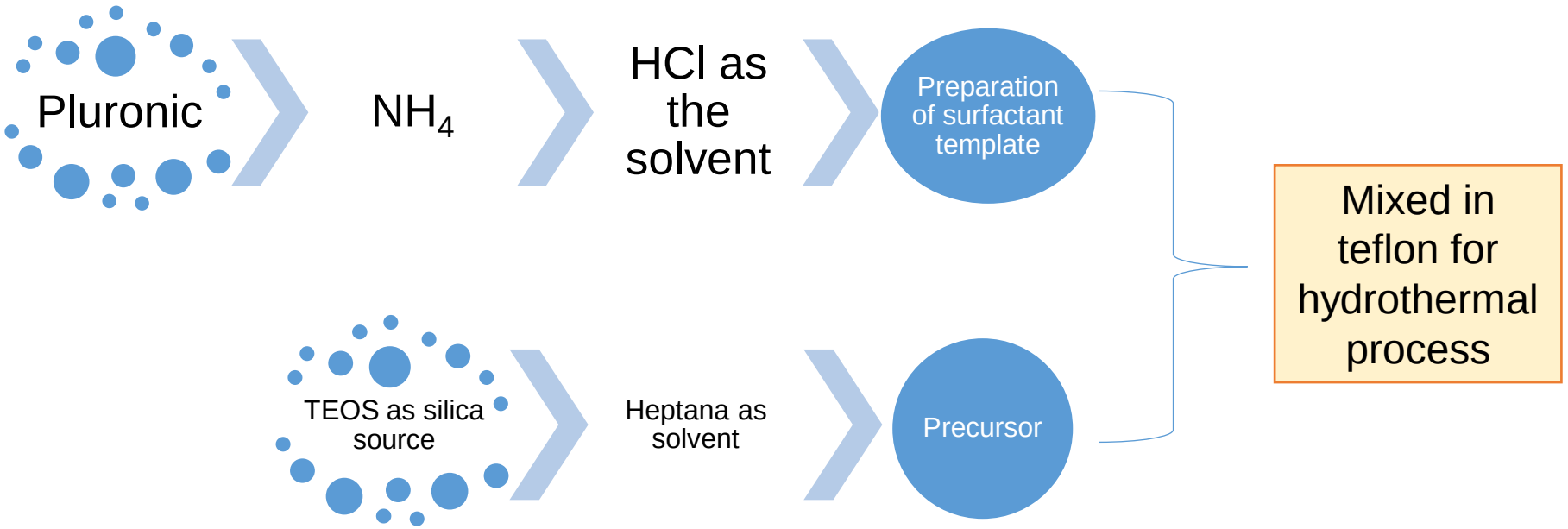
High surface area, large pore volume and pore diameter, and thermal stability

The materials used to provide the silica SBA-15 were

- Pluronics (P123, Poly(ethylene glycol)-*block*-poly(propylene glycol)-*block*-poly(ethylene glycol), average M_n ~ 5800)
- tetraethyl orthosilicate (TEOS, 98%),
- hydrochloric acid (HCl, 37%) from Merck,
- ammonium fluoride (NH_4F), and heptane were obtained from J.T. Baker

Procedure mothode by modified from Liang Chao et.al, 2010

The condition of initial Temp (T_1) and the hydrothermal process Temp (T_2)

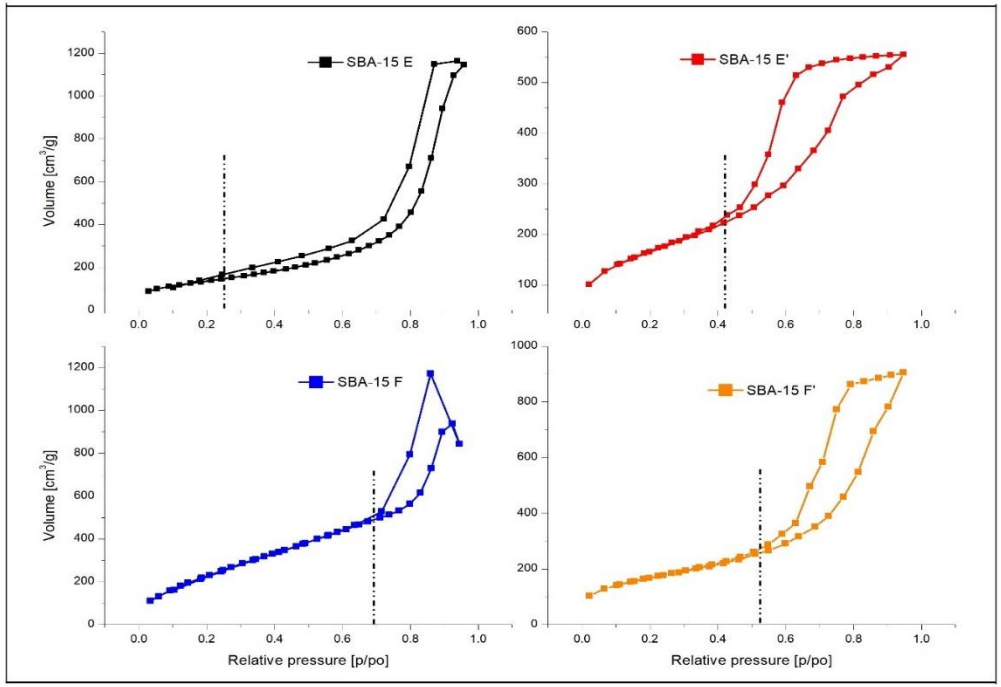


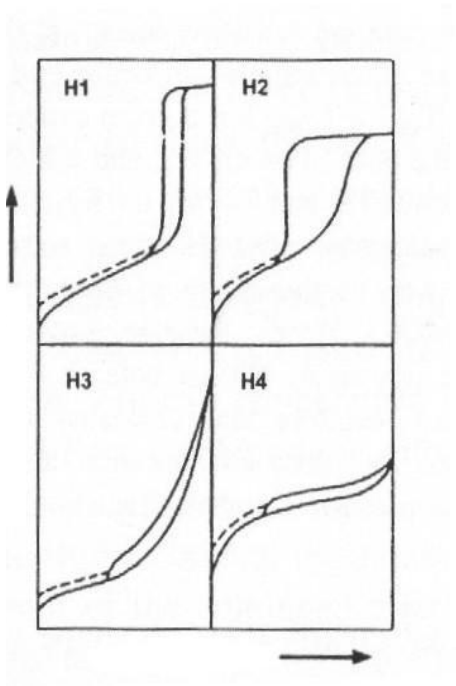
SBA-15 sample	T_1 (°C)	T_2 (°C)	Aging time (hour)
E	15	120	48
F	10	100	96

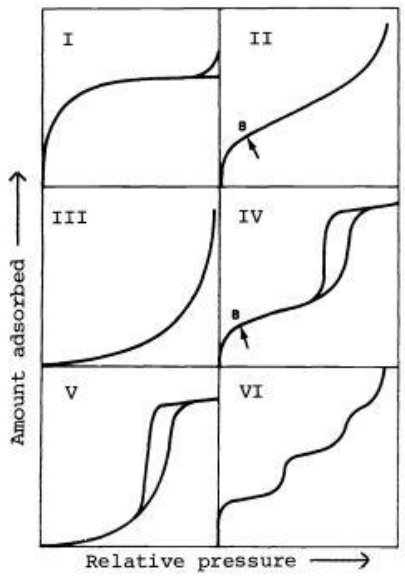
Surface area analysis by BET methode

Table 2. Multi-point BET analysis of silica SBA-15 sample

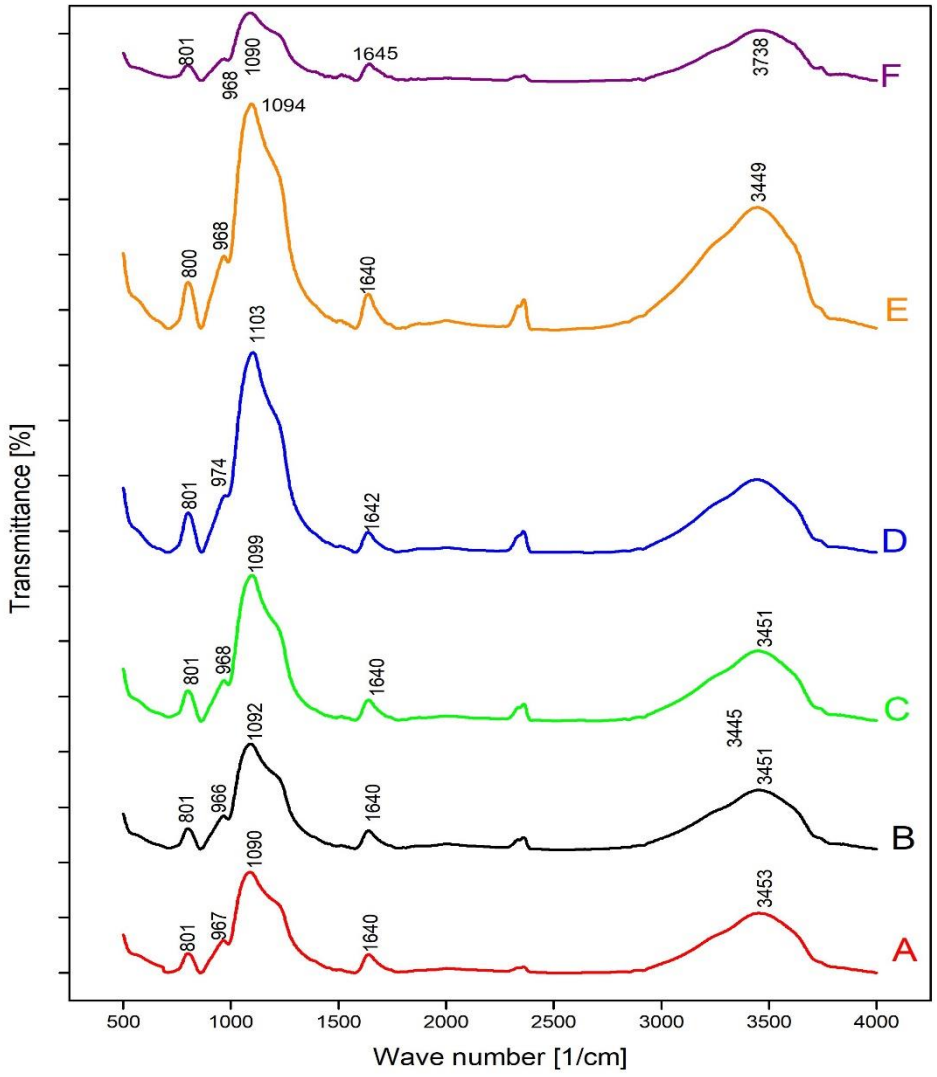
No	Name of sample	Multi-point BET analysis	Before adsorption application	After adsorption application (SBA-15 E' and F')	Confirm of BET analysis
1	SBA-15 E (adsorption of MBD)	S_{BET}, m^2/g	494	493	stable
		Pore volume, cm^3/g	1.70	0.86	decreased
		Pore diameter, nm	14.32	2.41	decreased
2	SBA-15 F (adsorption of Cu)	S_{BET}, m^2/g	948	594	decreased
		Pore volume, cm^3/g	1.30	1.30	stable
		Pore diameter, nm	5.50	4.69	stable







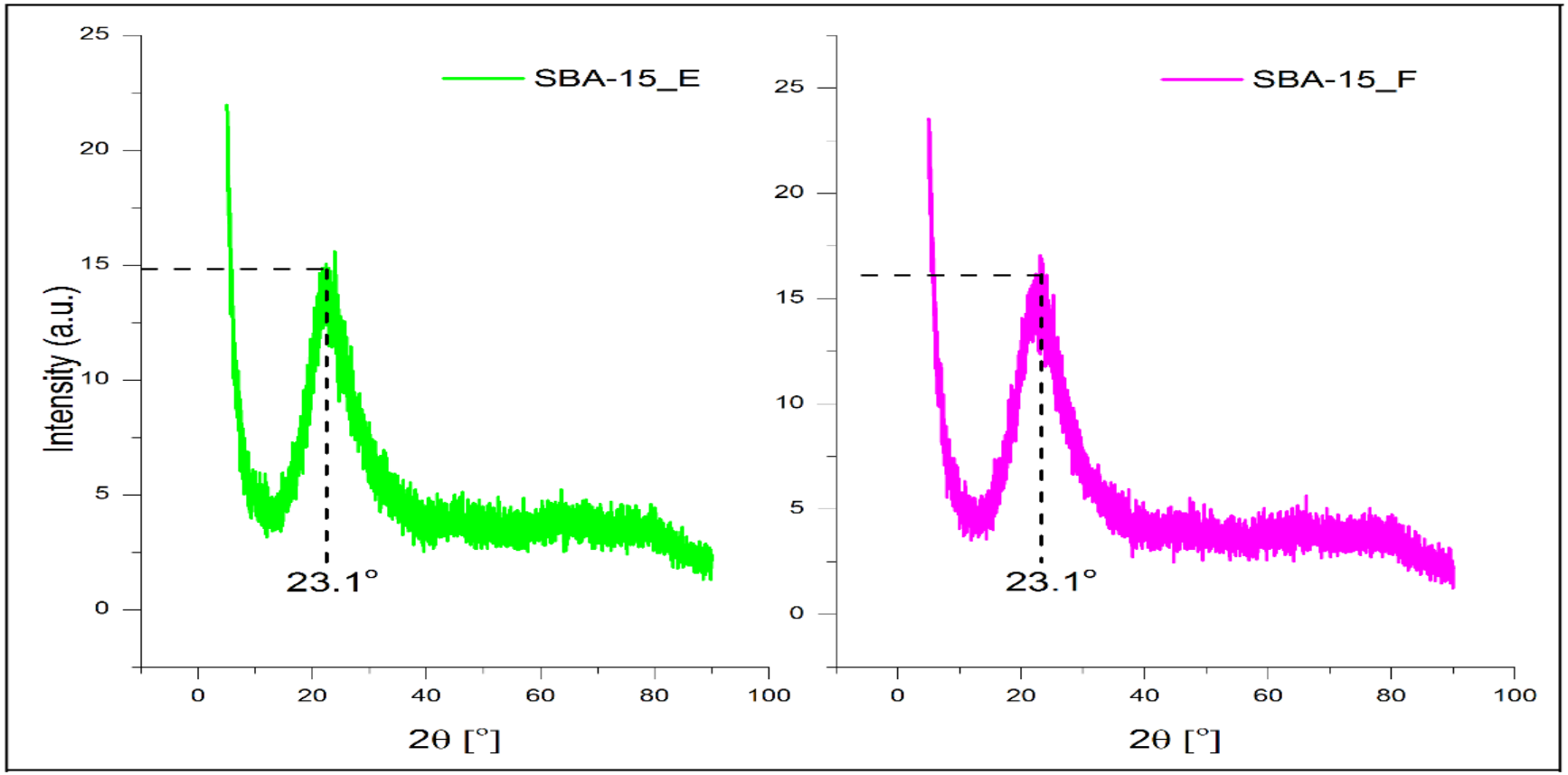
Sampel	Si-O-Si		Si-OH	
	Wavenumber	Intensity	Wavenumber	Intensity
SBA-15 E	968	0.651	3448	0.093
SBA-15 F	968	0.199	3452	0.458

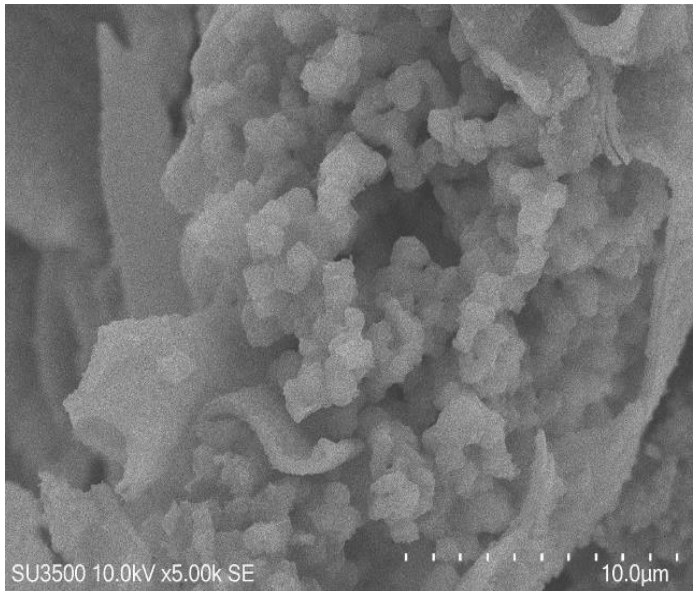


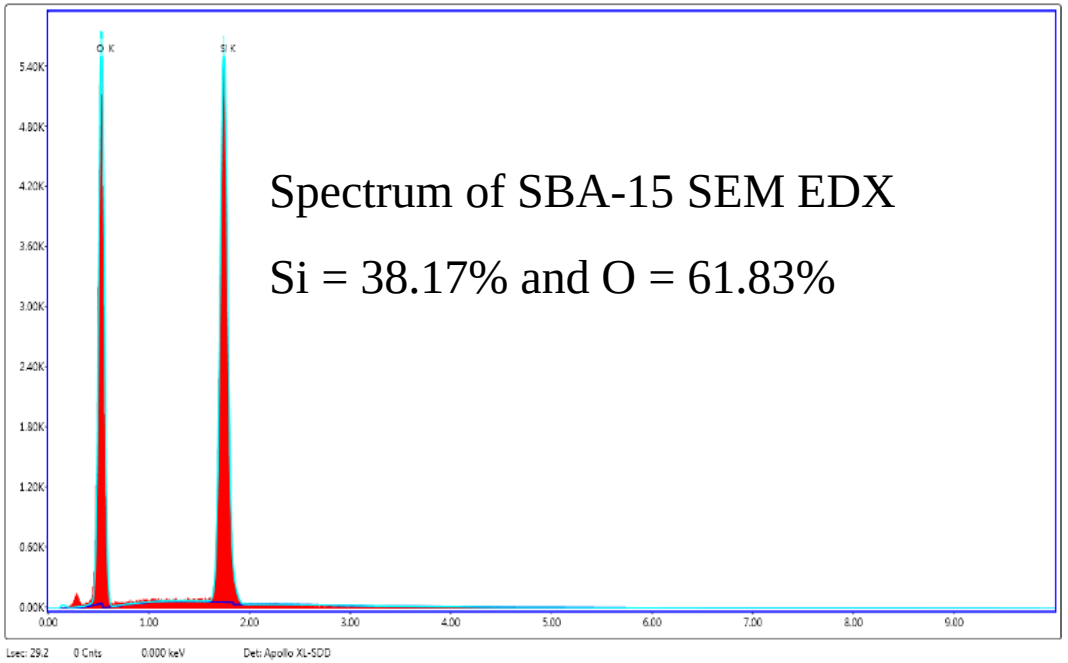
FTIR analysis

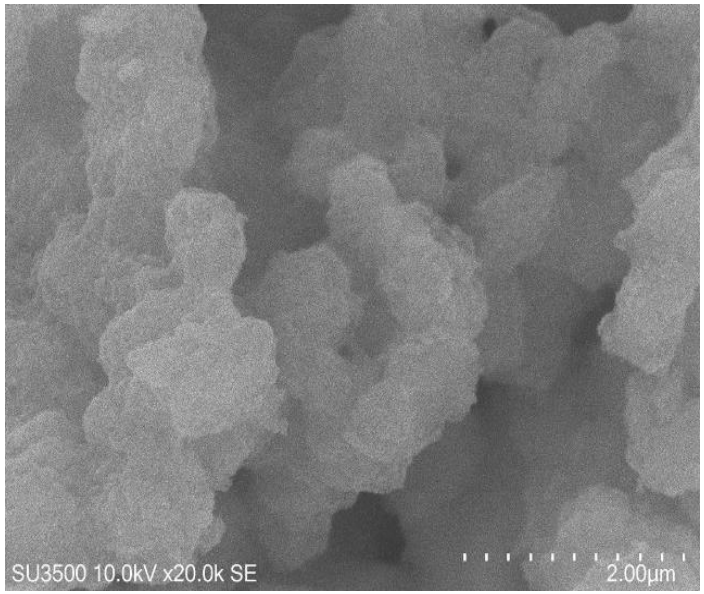
XRD Analysis

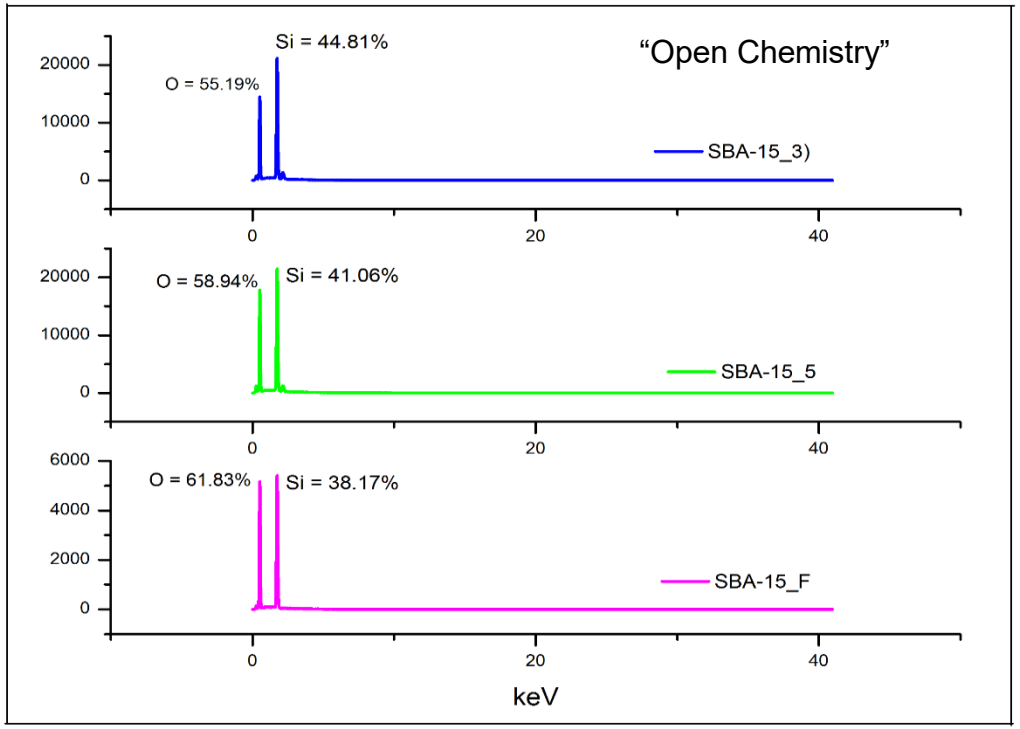
Sample	Crystal structure	Size crystal (nm)
E	Hexagonal	2.6
F	Hexagonal	1.9



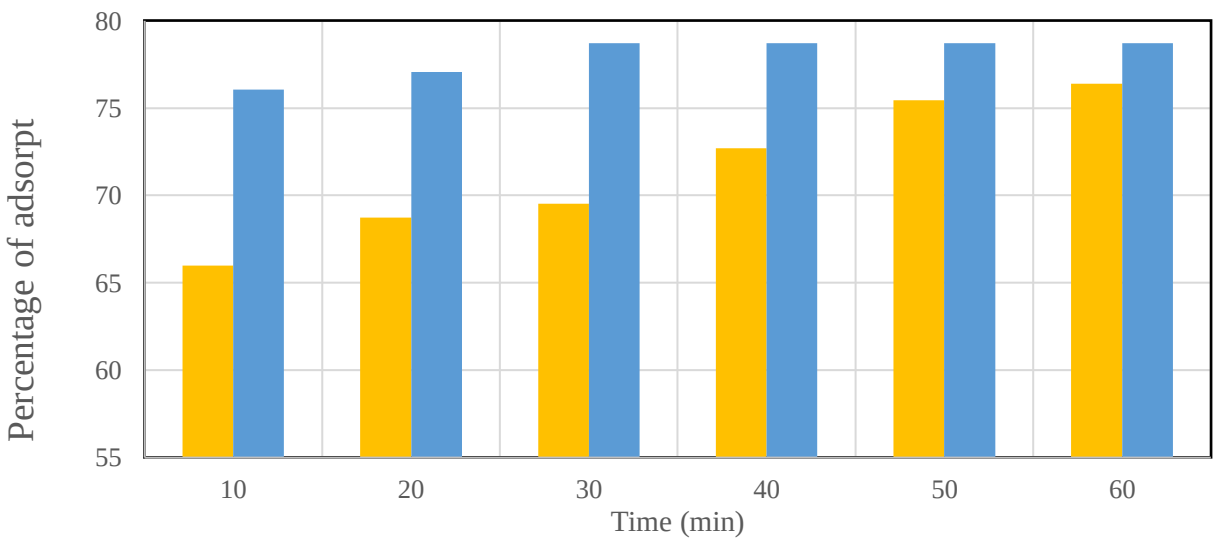

SU3500 10.0kV x5.00k SE
10.0µm


O K
Si K
Spectrum of SBA-15 SEM EDX
Si = 38.17% and O = 61.83%


SU3500 10.0kV x20.0k SE
2.00µm


"Open Chemistry"
Si = 44.81%
O = 55.19%
SBA-15_3)
O = 58.94%
Si = 41.06%
SBA-15_5
O = 61.83%
Si = 38.17%
SBA-15_F
keV

Photocatalytic adsorption of methylene blue and Cu(II)



CONCLUSION

1. This study shows that physical adsorption analysis and the physicochemical properties SBA-15 were conducted to understand the effect of the temperature preparation of surfactant template and hydrothermal treatment
2. The current data highlight the importance of large pore diameter and pore volume to trapt methylene blue dye and high surface area for active site to reduce copper (II)

Rasayan J. Chem., 12(3), 1117-1126(2019)
http://dx.doi.org/10.31788/RJC.2019.1235306

Table-2: Surface Analysis of SBA-15 Samples with Some Variables

SBA-15 sample	Conditions	S_{BET} $(m^2.g^{-1})^a$	Dp $(nm)^b$	Vp $(cc.g^{-1})^c$
A	(T_1 = 15°C, T_2 = 100°C) ; t=48 h	560	11.24	1.57
B	(T_1 = 15°C, T_2 = 100°C) ; t=96 h	554	12.67	1.44
C	(T_1 = 10°C, T_2 = 120°C) ; t=48 h	510	13.76	1.76
D	(T_1 = 10°C, T_2 = 120°C) ; t=96 h	548	8.97	1.49

[a]total BET surface area; [b]pore diameter determined from BJH method; [c]total pore volume

DE GRUYTER Open Chem., 2019; 17: 963–971

Research Article

Ridhawati Thahir*, Abdul Wahid Wahab, Nursiah La Nafie, Indah Raya

Synthesis of high surface area mesoporous silica SBA-15 by adjusting hydrothermal treatment time and the amount of polyvinyl alcohol

Table 2: Physisorption analysis of SBA-15 samples with some variables.

SBA-15 sample	Conditions	S_{BET} (m^2/g)	Dp (nm)	Vp (cc/g)
1	PVA 1 g, 20 h	628	4.4	1.40
2	PVA 2 g, 20 h	780	3.8	1.48
3	PVA 1 g, 24 h	892	4.2	1.87
4	PVA 2 g, 24 h	1726	3.2	1.40
5	PVA 1 g, 96 h	699	4.0	1.40


Thank you

Universitas Riau International Conference on Science and Environment 2021 (URICSE-2021)

Universitas Riau International Conference on Science and Environment 2021 (URICSE-2021)

Nur Islami, Roza Linda, Neni Hermita, Novitri, Dahnil Syah, Ninik Nihayatul Wahibah, Alfuzanni

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The Universitas Riau Internationa Conference on Science and Environment 2021 (URICSE-2021) was successfully held 11 September 2021 at the Universitas Riau, Pekanbaru, Indonesia. The events brought together academia, professional and researcher and students with interests on Science and Environment, thus offering them the opportunity to share and discuss their last research and findings, as well as to facilitate and encourage their mutual cooperation. This Proceedings issue compiles oral presentations that were submitted by the authors and rigorously reviewed by a special committee.

The URICET-2021 was organized by the Institute of Research and Community Services Universitas Riau, Indonesia with the theme of conference is Elevating Science and Environmental Quality for Sustainable Life.

The URICSE-2021 committee would like to thank you to all participant in the Universitas Riau International Conference on Science and Environment 2021 which has been held using Zoom application of Virtual Conference mode due to there is no allowance for gathering as impact of the Corona virus pandemic.

In this URICSE, we have invited 4 honourable keynote speakers. Prof. Dr. Yatimah Alias from University of Malaya, Malaysia, Prof. Dr. dr. Dedi Afandi, DFM, SpFM(K) from Universitas Riau, Indonesia, Prof. Dr. Erol Kurt from Gazi University, Turkey, and Prof. Dr. Yamamoto Koichi, from Yamaguchi University, Japan. All the keynote speakers talks have took place in the plenary session.

We would like to inform that the committee received a number of 191 full papers from Colombia, Russia, China, Vietnam, Iraq, Japan, Turkey, Malaysia and Indonesia. However, after reviewing; a total of 163 papers have been accepted for oral presentation, which is divided into 12 parallel sessions. All the accepted paper will be submitted to Journal of Physics: Conference Series of IOP Publishing.

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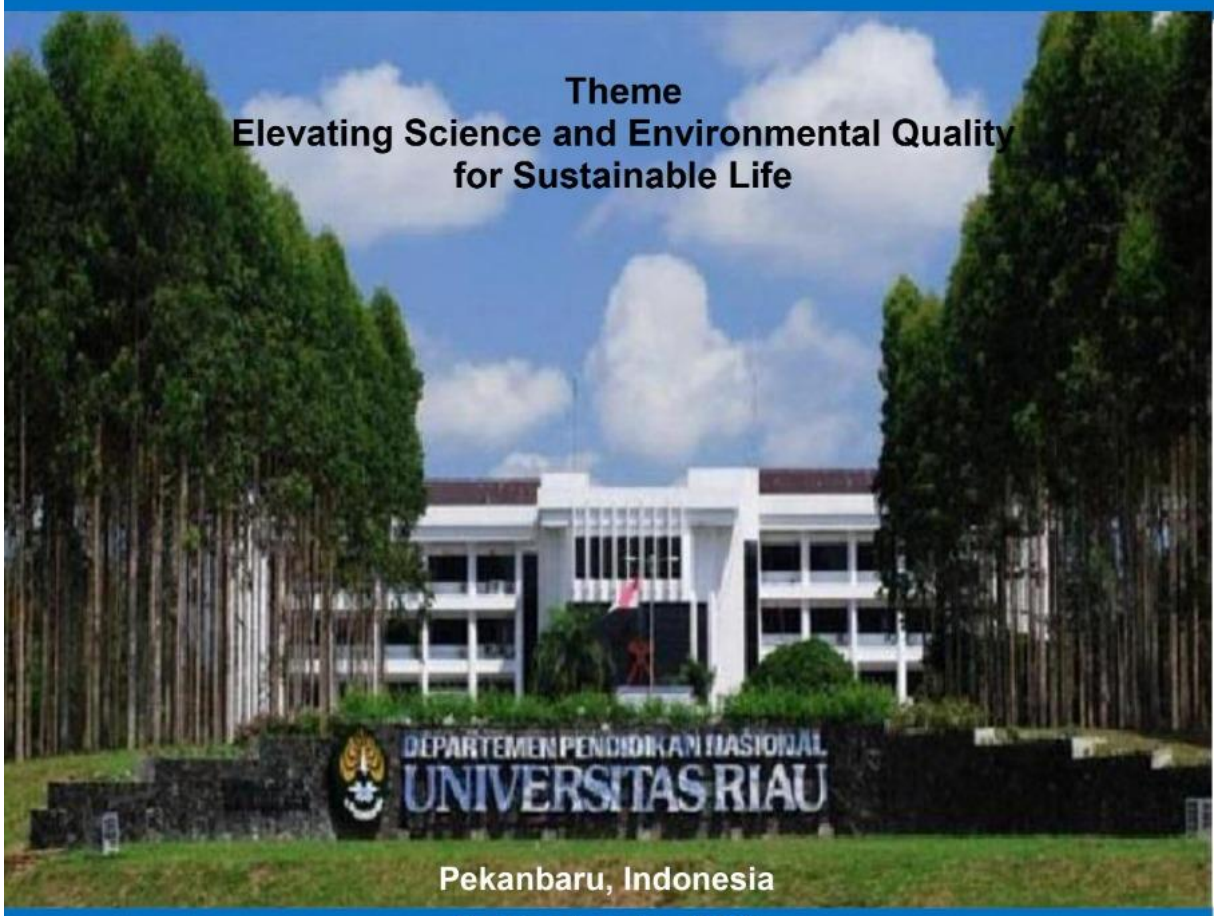

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10-12 September 2021, Pekanbaru, Indonesia

Accepted papers received: 29 September 2021
Published online: 25 October 2021

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Preface

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