



2nd FIRST 2018

Forum in Research, Science, and Technology
*Applied Technology for Sustainable Development
in Supporting Prosperous Human Existence*

October 30-31, 2018

Horison Ultima Hotel
Palembang, Indonesia

**CONFERENCE
PROCEEDING**

ISSN: 2461-0739

Published By:
Research and Community Service Center State Polytechnic of Sriwijaya
Jl. Sriwijaya Negara Bukit Besar 30139 Palembang
Sumatera Selatan, Indonesia

The 2nd Forum in Research, Science, and Technology FIRST 2018 INTERNATIONAL CONFERENCE



(The 2nd FIRST 2018)

OCTOBER 30-31, 2018 — PALEMBANG, OF SOUTH SUMATERA INDONESIA

Conference Programs And Abstract from the 2nd FIRST 2018

Edited by

**Polytechnic Of Sriwijaya
Palembang Of South Sumatera Indonesia
2018**



ORGANIZING COMMITTEE

International Advisory Committee

- Prof. Erry Yulian Triblas Adesta, International Islamic University, Malaysia
- Prof. Dr. Rahmat Budiarto, Al Baha University, Saudi Arabia Assoc
- Prof. Dr. Augustus E. Osseo-Asare University of Sunderland, United Kingdom
- Prof. Dr. Werner Rammense, Cologne University, Germany
- Prof. Badri Munir Sukoco, SE.,MBA.,Ph.D, Universitas Airlangga Indonesia

Steering Committee

- Prof. Muhammad Nizam, Ph.D, Universitas Sebelas Maret, Indonesia
- Prof. Dr. Mohammad Yeakub Ali, International Islamic University Malaysia Assoc.
- Prof. Ahmad Hoirul Basori, King Abdulaziz University, Saudi Arabia
- Mohammad Hossein Anisi, University of Essex, UK
- Dr. Zulhadi Zakaria, Politeknik Seberang Perai, Malaysia
- Dr. Ing. Ahmad Taqwa, M.T, Politeknik Negeri Sriwijaya, Indonesia
- Prof. Dr. Ir. Siti Nurmaini, Universitas Sriwijaya, Indonesia
- Prof. Assoc. Pindo Tutuko, Ph.D University of Merdeka, Malang, Indonesia
- Dr. Dodik Siswanto S.E., M.Sc. Acc, Universitas Indonesia
- Dr. Irwan Meilano ST,M.Sc, ITB, Indonesia
- Dr. Gancar Candra Premananto, SE., M.Si., Universitas Airlangga
- Munawar A. Riyadi, Universitas Diponegoro, Semarang, Indonesia
- Ir. Amrifan Saladin Mohruni Ph.D, Universitas Sriwijaya, Indonesia
- Dr. RD. Kusumanto, MM, Politeknik Negeri Sriwijaya, Indonesia
- Dr. H. Nandan Limakrisna, Ir., M.M., CQM, Universitas Persada Indonesia
- Irsyadi Yani, ST., M.Eng. PhD, Universitas Sriwijaya, Indonesia
- Dr. Yohandri Bow, MT, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Yuli Yetri, M.Si, Politeknik Negeri Padang
- Dr. Eng. Tresna Dewi, M.Eng., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Maya Fitri Oktarini S.T., M.T., Universitas Sriwijaya, Indonesia
- Ir. Indra Chandra Setiawan, M.T., PT. Toyota Motor Manufacturing, Indonesia

General Chair

Dr.Ir.Rusdianasari, M.Si, Politeknik Negeri Sriwijaya, Indonesia

General co-Chairs

- Carlos R. Sitompul, S.T.,M.T., Politeknik Negeri Sriwijaya, Indonesia
- Ir. Jaksen M. Amin, M.Si, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Rita Martini, SE.,M.Si.,Ak.,CA, Politeknik Negeri Sriwijaya, Indonesia

Publication Chairs

- Deris Stiawan, M,Kom, PhD., Universitas Sriwijaya, Indonesia
- Desloehal Djumrianti, S.E., MIS., PhD, Politeknik Negeri Sriwijaya, Indonesia
- Ade Silvia Handayani, S.T., M.T, Politeknik Negeri Sriwijaya, Indonesia

Technical Program Chairs

- Muhammad Abu Bakar Sidik, S.T., M.Eng., Ph.D, Universitas Sriwijaya, Indonesia
- Reza Firsandaya Malik, S.T., M.T., Ph.D, Universitas Sriwijaya, Indonesia
- Nyayu Latifah, S.T., M.T, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Herlambang Saputra, S.Pd., M.Kom., Politeknik Negeri Sriwijaya, Indonesia

Finance Chairs & Treasurer

Dr. Marieska Lupikawati, S.E., M.M, Politeknik Negeri Sriwijaya, Indonesia

Public Relation Chairs

- Ir. Irawan Rusnadi, M.T. , Politeknik Negeri Sriwijaya, Indonesia
- Drs Zakaria MPd., Politeknik Negeri Sriwijaya, Indonesia
- Dra. Tiur Simanjuntak, M.Ed.M, Politeknik Negeri Sriwijaya, Indonesia
- Sukandar S.Si.,M.T,Ph.D., Institut Teknologi Bandung, Indonesia
- Dr. GK Marriappen, Politeknik Seberang Perai, Malaysia
- Dr. Sari Lestari Zainal Ridho, SE., M.Ec, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Lambok Vera R Pangaribuan, S.E., M.Si, Ak, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Ir.Leila Kalsum, M.T, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Martha Aznury, M.Si., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Ir. Abu Hasan, M.Si., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Leily Nurul Komariah, S.T., M.T., Universitas Sriwijaya, Indonesia
- Anton Satria Prabuwono, King Abdulaziz University
- Irfan Syamsuddin, Politeknik Negeri Ujung Pandang, Indonesia

- Ahmad Hoirul Basori, King Abdulaziz University, Saudi Arabia
- Ermatita, Universitas Sriwijaya, Indonesia
- Irfan Syamsuddin, Politeknik Negeri Ujung Pandang, Indonesia
- Muhammad Syafrullah, Universitas Budi Luhur, Jakarta, Indonesia
- Anton Yudhana, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
- Zulfatman, Universitas Muhammadiyah Malang, Malang, Indonesia
- Mochammad Facta, Universitas Diponegoro, Semarang, Indonesia
- Imam Much Ibnu Subroto, Universitas Islam Sultan Agung, Semarang, Indonesia
- Uuf Brajawidagda, Politeknik Negeri Batam, Indonesia
- Firdaus, S.T., M.Kom., Universitas Sriwijaya, Indonesia
- Syarifah Putri Raflessia. S.Kom. M.T., Universitas Sriwijaya, Indonesia

Local Chairs

- Firdaus, S.T., M.T., Politeknik Negeri Sriwijaya, Indonesia
- Aladin SE, M.Si., Ak, CA, Politeknik Negeri Sriwijaya, Indonesia
- M. Miftahul Amin, S.Kom., M.Eng., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Evada Dewata, S.E., M.Si., Ak, CA, Politeknik Negeri Sriwijaya, Indonesia
- Dr. M. Syahirman Yus S.E., M.S., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Ir. Aida Syarif, M.T., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Neneng Miskiyah, S.E. M.Si., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Periansya, M.M., Politeknik Negeri Sriwijaya, Indonesia
- Dr. Markoni Badri, S.E., MBA, Politeknik Negeri Sriwijaya, Indonesia
- Dr. Heri Setiawan, M.M., Politeknik Negeri Sriwijaya, Indonesia
- Ikhtison Mekongga, S.T., M.Kom., Politeknik Negeri Sriwijaya, Indonesia
- Yudi Wijarnako, S.T., M.T., Politeknik Negeri Sriwijaya, Indonesia
- Pridson Mandiangan, S.E., M.M., Politeknik Negeri Sriwijaya, Indonesia
- Adewasti, S.T., M.Kom., Politeknik Negeri Sriwijaya, Indonesia
- Hairul, S.T., M.T., Politeknik Negeri Sriwijaya, Indonesia
- Eka Susanti, S.T., M.Kom., Politeknik Negeri Sriwijaya, Indonesia
- Leni Novianti, M.Kom., Politeknik Negeri Sriwijaya, Indonesia

Potential of Clay in Coal Mining of Tanjung Enim Area as a Filler on Rubber Compound

A Hasan^{1,2}, L Kalsum¹, M Yerizam¹, R Junaidi¹, M Taufik¹, M Aznury¹,
and Fatria¹

¹ Chemical Engineering Department, State Polytechnic of Sriwijaya, Srijaya Negara Street, Bukit Besar Palembang 30139, Indonesian

abu_hasan@polsri.ac.id

Abstract. The clay deposit in the coal mining area of Tanjung Enim has a deposit about five times its coal deposit. This clay has not been utilized except as glue on brick briquettes which are relatively small quantities. As a rubber filler, clay can be used, but the silica content is preferred in the clay. Therefore the composition of silica in clay must be known. This study aims to determine the content of silica in the clay contained in the coal mining area of Tanjung Enim. The research begins with clay drying, followed by the fineness of clay grain size to a size of about 10-50 microns. Furthermore, the analysis of the compounds there in is carried out using XRF. The results show that the silica content in the clay is about 53.74 - 75.29% and the highest content is in the Lower D layer 75.29% and followed by the Int B2-C layer 56.87% and Lower C 56.65 %. In general, the compounds in this clay are dominated by SiO₂, Al₂O₃, Fe₂O₃, MgO, TiO₂, and K₂O.

1. Introduction

Coal mining area in the Tanjung Enim, South Sumatra Province of Indonesian not only benefits coal mining companies in Tanjung Enim itself but also clay deposits located between coal layers are also quite promising to be explored and investigated. This clay is only a small portion used by PT Bukit Asam (Persero) Tbk. as briquette coal adhesive in addition to the reclamation of the surrounding mining area after the mining process. The total amount of clay deposits in the coal mining area is five times more than coal deposits.

In the design of rubber compounds, fillers are needed [1-4] especially to improve their physical properties and are very important. Research on the use of clay as a filler for rubber compounds has been widely practiced and includes modification of clay [5-32] but in Indonesia clay fillers for rubber have not been considered and most are still imported from abroad. Most of the clay in Indonesia is used as raw material for making pottery, cement raw materials and as an adsorbent [33-38]. Bond (1951), Schenck et. al. (1964), and Goodman and Riley (2012) [39-41] even patented local clay as a filler for rubber compounds. Another study of clay, as a catalyst in chemical processes, for example, was carried out by Adams et. Al. (1982), Xu et. Al. (2009), Nagendrappa (2011), Solak and Rutkowski (2014), Sirsam and Usmani (2015), and Bosco et. Al. (2016) [42-47]. Here it is seen that clay is very important to be investigated by paying attention to its compound content. The use of clay as a rubber filler can also reduce CO₂ emissions where carbon black which still dominates fillers in rubber products is produced with imperfect combustion process conditions of heavy fractions such as fluid catalytic cracking of tar, coal tar, ethylene tar crack, and with little comes from vegetable oil.



As a filler, the content of silica (SiO_2) in clay needs to be considered, because silica can have a significant effect on rubber vulcanization and improve its physical properties. Thus, the silica content in clay is interesting to study.

2. Materials and methods

2.1. Materials

The main material used in this research is clay contained in the coal mining area of PT Bukit Asam (Persero) Tbk. Tanjung Enim, South Sumatra Province in seven layers of clay.

2.2. Methods

The research method consists of sample preparation and testing of elemental content or compounds contained in the clay. Drying of the clay at 110°C for about 2 hours and followed by smoothing the sample until the clay has a size of about 10 - 50 microns. Preparation of this sample is done in Chemical Laboratory of Chemical Engineering Department of State Polytechnic of Sriwijaya. Further analysis of compounds in clay is done by using Uniquant XRF Bruker S8 Tiger owned by PT Cement Indonesia (Persero) Tbk.

3. Results and discussion

Analysis of compounds contained in the clay at coal mining area of Tanjung Enim, South Sumatra Province using XRF according to its layer is shown in table 1.

Table 1. Minerals content in clay layer located on an area of PT Bukit Asam (Persero) Tbk. South Sumatra Indonesian

Component	Minerals content in the clay layer						
	OB A1	Int A1-A2	Int A2-B1	Int B1-B2	Int B2-C	Lower C	Lower D
SiO₂	53.74 %	55.22 %	50.83 %	54.31 %	56.87 %	56.65 %	75.29 %
Al₂O₃	25.05 %	26.22 %	24.87 %	21.49 %	21.49 %	20.32 %	7.62 %
Fe₂O₃	4.90 %	1.45 %	3.28 %	4.97 %	3.45 %	6.22 %	7.25 %
TiO₂	0.90 %	0.79 %	1.03 %	0.90 %	0.90 %	0.87 %	0.33 %
MgO	1.52 %	0.68 %	0.40 %	1.19 %	0.67 %	1.79 %	1.82 %
K₂O	1.84 %	0.46 %	1.04 %	1.55 %	1.75 %	2.02 %	0.92 %
CaO	0.48 %	0.38 %	0.26 %	0.69 %	0.26 %	0.66 %	0.74 %
Na₂O	0.12 %	0.07 %	0.06 %	0.12 %	0.13 %	0.39 %	0.44 %
SO₃	1.24 %	0.51 %	3.07 %	1.86 %	3.02 %	2.09 %	0.22 %
MnO	0.12 %	0.01 %	0.02 %	0.11 %	0.01 %	0.07 %	0.05 %
P₂O₅	0.05 %	0.05 %	0.04 %	0.06 %	-	0.08%	0.10 %
Cr₂O₃	0.01 %	0.03 %	0.03 %	0.05 %	0.05 %	0.07 %	0.16 %
Others	10.03%	14.13%	15.07%	12.70%	11.40%	8.77%	5.06%

Table 1. shows that the compounds contained in the clay are dominated by SiO_2 , Al_2O_3 , Fe_2O_3 , MgO , TiO_2 , and K_2O but in terms of quantity SiO_2 is the most compound found in various layers in clay around 53.74 - 75.29% followed by Al_2O_3 content of about 7.62 -26.22%, and the third largest was Fe_2O_3 1.45

- 7, 25%. The highest SiO_2 content is in the Lower D layer of about 75.29%, and the lowest in the Int A2-B1 layer is about 50.83% while the highest Al_2O_3 content in the Int A1-A2 layer is in the range of 26.22% and the lowest in the Lower D layer in the range of 21.49%. The content of SiO_2 , Al_2O_3 , Fe_2O_3 in this clay can also be compared with the results of analysis using SEM-EDS conducted by Hasan and Taufik in 2014 [48], Hasan et.al. in 2015 using XRD [49], and by Konta (1963), Herziq et. al. in 1998, as well as Muriithi et.al. (2012), and Jeong and Achterberg (2014) [50-53]. The results of these researchers showed different results depending on where the clay source was obtained. For comparison,

the quantitative clay mineral analysis using XRD is shown in figure 1. From this figure, the silica content is 77.84% as quartz mineral followed by another muscovite 11.15% and microcline 3.71%.

High silica content is very interesting, because silica is not only used as a filler on rubber but also for catalysts such as silica is used as catalyst support such as Min et al. (2003), Kababji et al. (2009), and Dixit et. al. (2013) [54-56] and as a catalyst mixture which included Irurzun et al. (2009), Ray et al. (2015), and Adamson et al. (2004) [57-59].

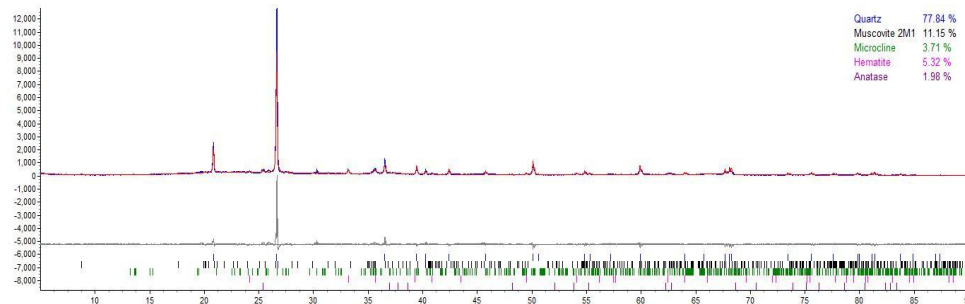


Figure 1. Quantitative analysis of clay using XRD performed by Hasan et. al. (2015) [49]

4. Conclusions

The conclusion obtained from this research is the silica content of clay in the coal mining area of PT Bukit Asam (Persero) Tbk. in the Lower D layer is 75.29%. Not only silica, but the content of alumina and iron oxide is also quite high content. In general, the silica content in each layer ranges from 53.74 to 75.29%

5. References

- [1] Andrews E H 1963 *Rubber Chemistry and Technol.* **36** 325-36.
- [2] Morton M 1987 *Rubber Technology* (New York: Van Nostrand Reinhold) Chapter 3 Part II
- [3] Yu L 2009 *Biodegradable Polymer Blends and Composites from Renewable Resources* (John Wiley and Sons) Chapter 17.
- [4] Mujkanovic A, Vasiljevic L, and Ostojic G 2009 *Non-Black Fillers For Elastomers*. 13th International Research/Expert Conference "Trends In The Development Of Machinery And Associated Technology" TMT 2009, Hammamet, Tunisia, 16-21 October 2009
- [5] Uddin F 2008 *Metallurgical and Materials Transactions A.* **39A** 2804-14
- [6] Ambre A, Jagtap R, and Dewangan B 2008 *Journal of Reinforced Plastics and Composites* **28** 343-52.
- [7] Sukumar R and Menon A R R 2008 *J. of Applied Polymer Science* **107** 3476–83 (2008)
- [8] Yahaya L E, Adebowale K O, and Menon A R R 2009 *Applied Clay Science* **46** 283–8
- [9] Jia D, Liu L, Wang X, Guo B, and Luo Y 2009 Edited by Long Yu (John Wiley & Sons, Inc.) CHAPTER 17, 416-33
- [10] Liu Y, Li L, and Wang Q 2010 *Journal of Applied Polymer Science* **118** 1111–20
- [11] Zhang Y, Liu Q, Zhang Q, and Lu Y 2010 *Applied Clay Science* **50** 255-9
- [12] Albano C, Hernandez M, Ichazo M N, Gonzalez J, and DeSausa W 2011 *Polym. Bull.* **67** 653-67
- [13] Panwar A, Choudhary V, and Sharma D K 2011 *J. of Reinforced Plastics and Composites* **30** 446-59.
- [14] Ismail H and Mathialagan M 2011 *Polymer-Plastics Technology and Engineering* **50** 1421–28
- [15] Lalikova S, Pajtasova M, Chromcikova M, Liska M, Sutinska V, Olsovsky M, Ondrusova D, and Mojumdar S C 2011 *J Therm Anal Calorim* **104** 969–73
- [16] Albano C, Rodriguez B, Karam A, Hernandez M, Ichazo M N, Gonzalez J, and Covis M 2012 *Polym. Bull.* **68** 1935-50

- [17] Goodman H and A. Riley A 2012 US8183316 B2
- [18] Saritha A, Joseph K, Thomas S, and Muraleekrishnan R 2012 *J. of Applied Polymer Science* **124** 4590–7
- [19] Zhang Q, zhang Y and Wang Y 2012 *Applied Mechanics and Materials* **164** 142-5
- [20] Jagtap S B, Rao V S, and Ratna D 2013 *Journal of Reinforced Plastics and Composites* **32** 183-96.
- [21] Szustakiewicz K, Cichy B, Gazińska M, and Pigłowski J 2013 *J. of Reinforced Plastics and Composites* **14** 1005-17.
- [22] Harahap H, Surya I, Ismail H, Kamil E, Khoesoema E, and Surya E 2013 Paper Presented On The 11th International Conference On Mining, Materials And Petroleum Engineering And The 7th International Conference On Earth Resources Technology. Asean Forum On Clean Coal Technology. Chiang Mai Thailand. 15-9
- [23] Zhang Y, Zhang Q, Liu Q, Cheng H, and Frost R L 2014 *J Therm Anal Calorim.* **115** 1013–20
- [24] Ruamcharoen J, Ratana T, and Ruamcharoen P 2014 *Polymer Engineering And Science* **54** 1436-43
- [25] Ogbemor O J, Oikiemen F E, Ogbeifun D E, and Okwo U N 2015 *Chem. Ind. Chem. Eng.* **4** 477-84
- [26] Ogbemor O J, Oikiemen F E, Ogbeifun D E, and Okwo U N 2015 *Advance in Materials* **4** 75-9
- [27] Puglia D, Fortunati E, D'Amico D A, Miri V, Stoclet G, Manfredi L B, Cyras V P, and Kenny J M 2016 *J Polym Environ.* **1** 12–22
- [28] Sheikh S H, Yin X, Ansarifar A, and Yendall K 2017 *J Reinforced Plastic and Composites* **36** 1132-45
- [29] Sreelekshmi R V, Brahmakumar M, Sudha J D, and Menon A R R 2017 *Applied Clay Science* **141** 171–9
- [30] Kord B, Ravanfar P, and Ayrilmis N 2017 *J Polym Environ.* **25** 1198–1207
- [31] Sreelekshmi RV, Sudha J D, and Menon A R R 2017 *Polym. Bull.* **74** 783–801
- [32] Peter R, Sreelekshmi R V, and Menon A R R 2018 *J Polym. Environ.* **26** 39-47
- [33] Nufida B A, Kurnia N, and Kurniasih Y 2014 *Prosiding of Seminar Nasional Kimia, Jurusan Kimia Fmipa Universitas Negeri Surabaya, 20 September 2014*
- [34] Hsu Y C, Chiang C C, and Yu M F 1997 *Separation Science and Technology* **32** 2513-34
- [35] Diantariani N P 2010 *Jurnal Kimia* **4** 91-100
- [36] Priadi C R, Anita, Sari P N, and Moersidik S S 2014 *Reaktor* **15** 10-19
- [37] Kausar A, Iqbal M, Javed A, Aftab K, Nazli Z H, Bhatti H N, and Nouren S 2018 *J. of Molecular Liquids* **256** 395-407
- [38] Adeyemo A A, Adeoye I O, and Bello O S 2017 *Applied Water Science.* **7** 543–68
- [39] Schenck L M, Harry K, Hodgkiss J A 1964 <https://patents.google.com/patent/US3148158A/en> (accessed April, 16th 2018)
- [40] Bond J G R 1951 <https://patents.google.com/patent/US2551580A/en> (accessed April, 16th 2018)
- [41] Goodman H and Riley A 2012. Clay Mineral Products and Their Use in Rubber Compositions. US8183316 B2
- [42] Adams J M, Clement D E, and Graham S H 1982 *Clay and clay minerals.* **30** 129-34
- [43] Xu H Y, He X L, Wu Z, Shan L W, and Zhang W D 2009 *Bull. Korean Chem. Soc.* **30** 2249-52
- [44] Nagendrappa G 2011 *Applied Clay Science* **53** 106-8
- [45] Solak A and Rutkowski P 2014 *Waste Management.* **34** 504-12
- [46] Sirsam R and Usmani G 2015 *Int. J. of Research in Eng. and Tech.* **4** 144-50
- [47] Bosco S M D, Gonçalves M, Figueiredo F C A, Galhardo T, and Carvalho W A 2016 *Waste and Biomass Valorization,* **7** 1279–88
- [48] Hasan A and Taufik M 2014 Karakterisasi Awal Unsur Yang Ada Pada Tanah Liat Di PT. Bukit Asam (Persero) Tbk. Menggunakan SEM. (State Polytechnic of Sriwijaya: Research report, unpublished)

- [49] Hasan A, Taufik M, and Aznury M 2015 Analisis Senyawa Yang Terdapat Pada Tanah Liat Di Area Penambangan Batu Bara Pt. Bukit Asam (Persero) Tbk. Menggunakan Xrd (X-Ray Diffraction) (State Polytechnic of Sriwijaya: Research report, unpublished)
- [50] Konta, J 1963 *Clay Minerals Bulletin* **5** 255-264
- [51] Herzig P M, Humphris S.E., Miller D J, Zierenberg R A, and Sturz A, Itoh M, and Smith S 1998 *Proceedings of the Ocean Drilling Program, Scientific Results*, **158**
- [52] Muriithi N T, Karoki K B, and Gachanja A N 2012 *International Journal of Physical Sciences* **7** 5865-69
- [53] Jeong G. Y. dan Achterberg E P 2014 *Atmos. Chem. Phys.* **14** 12415–28
- [54] Min B K, Santra A K, and Goodman D W 2003 *Catalysis Today* **85** 113–24
- [55] Kababji H, Joseph B, and Wolan J T 2009 *Catal Lett* **30** 72–78
- [56] Dixit M, Mishra, Joshi P A, and Shah D O 2013 *Procedia Engineering* **51** 467 – 72
- [57] Adamson D H, Dabbs D M, Morse D E, and Aksay I A 2004 *Polymeric Materials: Science & Engineering* **90** 239-40
- [58] Irurzun V M, Tan Y, and Resasco D E 2009 *Chem. Mater* **21** 2238–46
- [59] Ray S, Banerjee B, Bhaumik A, and Mukhopadhyay C 2015 *Catalysis Communications* **58** 97–102

Acknowledgments

Acknowledgments are addressed to DRPM Kemenristekdikti through PTUPT 2017 fiscal year with contract number PUPT 050 / SP2H / LT / DRPM / IV / 2017 dated 25 April 2017. Acknowledgments are also addressed to PT Bukit Asam (Persero) Tbk. for the aid of clay samples, and PT Cement Indonesia (Persero) Tbk. especially the Central Research Laboratory of Cement that assists the analysis using XRF



2nd FIRST 2018 INTERNATIONAL CONFERENCE
FORUM IN RESEARCH, SCIENCE, AND TECHNOLOGY (FIRST)
OCTOBER 30-31, 2018

CERTIFICATE OF APPRECIATION

is awarded to

MUHAMMAD YERIZAM

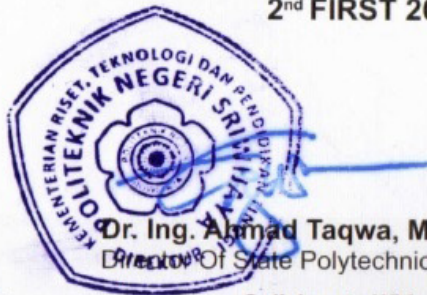
in recognition & appreciation of the contribution as

PARTICIPANT

In

2nd FIRST 2018 Coaching Clinic & Research Writing Workshop

Held On October 31, 2018
HORISON ULTIMA HOTEL
Palembang, Indonesia



Dr. Ing. Ahmad Taqwa, M.T.
Director Of State Polytechnic Of Sriwijaya



Dr. Ir. Rusdianasari, M.Si.
Chair Of 2nd FIRST 2018

Organized By :



Collaborate With :



الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
بونسو وسنڠ السنڠا انتارا نغسا بلانسنا



University of Cologne



University of Sunderland