Materials science Engineering and Chemistry

MATEC Web of Conferences

Proceedings

Search

Search results Advanced Search Help

Current Filters

No current filter

Geopolymer Mortar with Fly Ash

Search

Sort by Relevance

Display 10 | 50

55 results (1.196 seconds)

Displaying 1 to 50

Refine results

Published in

MATEC Web of Conferences (55)

Content type

proceedings (55)

Access type

Open Access (55)

Publication Years

2017 (19)
2018 (12)
2016 (9)
2019 (8)
2014 (3)

1. Open Access

en **Contribution of Fineness Level of Fly Ash to the Compressive Strength of Geopolymer Mortar**

Firdaus, Ishak Yunus and Rosidawani

MATEC Web of Conferences 103, 01026 (2017)

Contribution of Fineness Level of **Fly Ash** to the Compressive Strength of **Geopolymer Mortar**

More

PDF (1.55 MB)

2. Open Access

en **Geopolymer Mortar with Fly Ash**

Saloma, Anis Saggaff, Hanafiah and Annisa Mawarni

MATEC Web of Conferences 78, 01026 (2016)

Geopolymer Mortar with Fly Ash

More

PDF (133.7 KB)

3. Open Access

en **Effect of Variability of Fly Ash Obtained from the Same Source on Characteristics of Geopolymer**

More

Antoni, Juan Satria, Agung Sugiarto and Djwantoro Hardjito

OK

Authors

Mohd Mustafa Al Bakri Abdullah (4)
An Cheng (3)
Hui-Mi Hsu (3)
Jia-Ruey Chang (3)
Li-Wei Teng (3)

More

PDF (124.2 KB)

4. Open Access

en **The effect of water binder ratio on strength development of class C fly ash geopolymer mortar prepared by dry geopolymer powder**

Arie Wardhono

MATEC Web of Conferences 258, 05032 (2019)

More strict supervision. This paper reports the effect of water binder ratio on strength development of **fly ash geopolymer mortar** using dry **geopolymer** powder. **Fly ash with** high calcium content was used as

More

PDF (1.443 MB)

5. Open Access

en **Properties of Palm Oil Fuel Ash (POFA) Geopolymer Mortar Cured at Ambient Temperature**

Monita Olivia, Lora Mona Tambunan and Edy Saputra

MATEC Web of Conferences 97, 01006 (2017)

Properties of Palm Oil Fuel **Ash** (POFA) **Geopolymer Mortar** Cured at Ambient Temperature

More

PDF (134.7 KB)

6. Open Access

en **Effect of High Temperature on Mechanical Properties of Geopolymer Mortar**

Mateusz Sitarz, Izabela Hager and Joanna Kochanek

MATEC Web of Conferences 163, 06004 (2018)

Połaniec **Fly Ash** made it possible to obtain noncementitious material **with** compressive strength of 18.5 MPa. The article presents the results of a comparison of characteristics of **geopolymer mortar** and Portland

More

PDF (644.2 KB)

7. Open Access

en **Mechanical properties of fly ash geopolymer mortar reinforced with carbon fibers**

Qais Frayyeh and Ahmed Swaif

MATEC Web of Conferences 162, 02028 (2018)

Portland cement industry releases high amounts of CO2, so efforts have been made for alternative binders. Geopolymers are one of the highlighted elective binders. The aims of this study are to produce **fly ash Geopolymer** boards reinforced **with** carbon fibers and investigate the mechanical properties of

OK

PDF (307 KB)

8. Open Access

en **Preparation and Characterization of Manganese Slag and Fly Ash-based Geopolymer**

Ya-guang Wang, Feng-lan Han, Shi-zhen Zhao and Jing-qiu Mu

MATEC Web of Conferences 130, 04006 (2017)

Preparation and Characterization of Manganese Slag and **Fly Ash**-based **Geopolymer**

More

PDF (609 KB)

9. Open Access

en **Effect Of Crumb Rubber On Compressive Strength Of Fly Ash Based Geopolymer Concrete**

Ahmad Azrem Azmi, Mohd Mustafa Al Bakri Abdullah, Che Mohd Ruzaidi Ghazali, Andrei Victor Sandu and Kamarudin Hussin

MATEC Web of Conferences 78, 01063 (2016)

Effect Of Crumb Rubber On Compressive Strength Of **Fly Ash** Based **Geopolymer** Concrete

More

PDF (84.37 KB)

10. Open Access

en **The Effect of Lime Addition on the Setting Time and Strength of Ambient Cured Fly Ash Based Geopolymer Binder**

Andi Arham Adam, Nur Hayati Amiri, I. Wayan Suarnita and Nicodemus Rupang

MATEC Web of Conferences 47, 01015 (2016)

Ambient Cured **Fly Ash** Based **Geopolymer** Binder Andi Arham Adam 1 , a , Nur Hayati Amiri 1 , I . Wayan

More

PDF (268.0 KB)

11. Open Access

en **Characterization and acid resistance test of one-part geopolymer from fly ash and water treatment sludge**

Aileen Orbecido, Vuong Ho, Hirofumi Hinode, Winarto Kurniawan, Long Nguyen and Michael Angelo Promentilla

MATEC Web of Conferences 156, 05003 (2018)

inert octahedral coordinated aluminium , particularly for **geopolymer** formation [12]. **Geopolymer**

OK

More

PDF (561 KB)

Mortar

R. Jeyalakshmi, M. Sivasakthi, T. Revathi and N.P. Rajamane
MATEC Web of Conferences 97, 01034 (2017)

Fire Related Temperature Resistance of **Fly Ash** Based **Geopolymer Mortar**

More

PDF (644.1 KB)

13. Open Access

en **Investigation on mixture design of one-part geopolymer from fly ash and water treatment sludge**
Vuong Ho, Aileen Orbecido and Michael A. Promentilla
MATEC Web of Conferences 156, 05009 (2018)

presents a one-part **geopolymer** system from coal **fly ash** and water treatment sludge . **Geopolymer** is

More

PDF (452 KB)

14. Open Access

en **Compressive Strength of Fly ash-based Geopolymer Concrete with a Variable of Sodium Hydroxide (NaOH) Solution Molarity**
Herwani, Ivindra Pane, Iswandi Imran and Bambang Budiono
MATEC Web of Conferences 147, 01004 (2018)

Compressive Strength of **Fly ash**-based **Geopolymer** Concrete **with** a Variable of Sodium Hydroxide (NaOH) Solution Molarity

More

PDF (382 KB)

15. Open Access

en **Adhesion characteristics of geopolymer mortar to concrete and rebars**
Sanjay Pareek, Hiroo Kashima, Ippei Maruyama and Yoshikazu Araki
MATEC Web of Conferences 258, 01012 (2019)

Yuta Igarashi, Sanjay PAREEK, Effects of Slag Replacement Ratio and Curing Condition on the Compressive Strength of **Geopolymer** Mortars Using **Fly Ash** from India and Japan, Proceedings of the Japan Concrete Institute (Japanese), 37, 1885–1890, (2015)

More

PDF (2.507 MB)

16. Open Access

en **Lightweight geopolymer composites as structural elements with improved insulation capacity**
Glikeria Kakali, Dimitris Kioupis, Aggeliki Skaropoulou and Sotiris Tsivilis
MATEC Web of Conferences 149, 01042 (2018)

17. Open Access

en **Lightweight geopolymer composites as structural elements with improved insulation capacity**

Glikeria Kakali, Dimitris Kioupis, Aggeliki Skaropoulou and Sotiris Tsivilis

MATEC Web of Conferences 149, 01042 (2018)

> to ASTM C 618 , as the sum of the oxides SiO 2 + Al 2 O 3 + Fe 2 O 3 is higher than 70 %. **Fly ash** was

More

PDF (522 KB)

18. Open Access

en **Review of Dolomite as Precursor of Geopolymer Materials**

E.A. Azimi, M.M.A.B. Abdullah, L.Y. Ming, H.C. Yong, K. Hussin and I.H. Aziz

MATEC Web of Conferences 78, 01090 (2016)

> , but **with** the additional advantage of lower greenhouse emissions [6]. **Geopolymer** technology is also

More

PDF (148.7 KB)

19. Open Access

en **On The Physico-Mechanics, Thermal and Microstructure Properties of Hybrid Composite Epoxy-Geopolymer for Geothermal Pipe Application**

Ira Firawati, Jasruddin and Subaer

MATEC Web of Conferences 97, 01007 (2017)

> Y. Yusuf, Z. Zuki, G. Refnita, Pengaruh Penambahan Abu Terbang (**Fly Ash**) Terhadap Kuat Tekan **Mortar** Semen Tipe PCC Serta Analisis Air Laut yang Digunakan untuk Perendaman, Prosiding SEMIRATA. 1 (2013)

More

PDF (2.097 MB)

20. Open Access

en **Role of total reactive oxide ratios on strength development in activated fly ash**

G.V.P. Bhagath Singh and Kolluru V.L. Subramaniam

MATEC Web of Conferences 120, 02014 (2017)

> D. Hardjito, B.V. Rangan, Development and Properties of Low-Calcium **Fly Ash** based **Geopolymer** Concrete. Australia Curtin University of Technology, Perth, p.48, (2005).

Mor OK

PDF (1.56 MB)

21. Open Access

small particle sizes **fly ash with** low carbon content as an additive to cement . **Fly ash with** these

More

PDF (1.053 MB)

22. Open Access

en **Effect of GGBS and curing temperature on microstructure characteristics of lightweight geopolymer concrete**

Hilal El-Hassan, Najif Ismail, Sara Al Hinaii, Asma Alshehhi and Noor Al Ashkar

MATEC Web of Conferences 120, 03004 (2017)

Wallah SE, Rangan BV. Low-Calcium **Fly Ash** Based **Geopolymer** Concrete: Long-Term Properties. Perth, Australia: Curtin University of Technology, (2006).

More

PDF (3.31 MB)

23. Open Access

en **Optimum Mix for Pervious Geopolymer Concrete (GEOCRETE) Based on Water Permeability and Compressive Strength**

Salaheddin Abdulsalam Arafa, Ahmad Zurisman Mohd Ali, Siti Nazahiyah Rahmat and Yee Loon Lee

MATEC Web of Conferences 103, 01024 (2017)

D. Sumajouw, D. Hardjito, S. Wallah, B. Rangan, **Fly ash**-based **geopolymer** concrete: Study of slender reinforced columns, J. of Materials Science, 42(9), 3124–3130 (2007)

More

PDF (199 KB)

24. Open Access

en **Application of fly ash/granulated blast-furnace slag cementing material for immobilization of Pb2+**

Li Chao and Zhao Feng-qing

MATEC Web of Conferences 175, 01020 (2018)

cementitious materials is to maximize the use of industrial waste [7-9]. **Fly ash** is a fine particulate solid waste **with** pozzolanic properties . Under certain conditions , when **fly ash** is mixed **with** lime and other

More

PDF (478 KB)

25. Open Access

OK

en **Development of a low-cost cement free polymer concrete using industrial by-products and dune sand**

Najif Ismail, Moustafa Mansour and Hilal El-Hassan

More

PDF (1.26 MB)

26. Open Access

en **The Spalling of Geopolymer High Strength Concrete Wall Panels and Cylinders Under Hydrocarbon Fire**

Ahmad Zurisman Mohd Ali and Jay Sanjayan

MATEC Web of Conferences 47, 02005 (2016)

can be produced by activation of **fly ash** . **Geopolymer** concrete is produced by combining these resins **with** coarse and fine aggregates using the conventional concrete technology methods . Since **fly ash** is

More

PDF (8.803 MB)

27. Open Access

en **A Study on Marble-Based Geopolymer**

Ta-Wui Cheng, Yung-Chin Ding, Wei-Hao Lee and Po-chang Lu

MATEC Web of Conferences 97, 01004 (2017)

). By comparing **with** traditional coal **fly ash**-based **geopolymer** , as shown in Figure 5 , it can be found

More

PDF (953.0 KB)

28. Open Access

en **Rheology of Cementitious Materials: Alkali-Activated Materials or Geopolymers**

F. Puertas, M.M: Alonso, S. Gismera, M. Lanzón and M.T. Blanco-Varela

MATEC Web of Conferences 149, 01002 (2018)

rheology of pastes , mortars and concretes prepared **with** siliceous **fly ash** as precursor , is comparable to

More

29. Open Access

en **Rheology of Cementitious Materials: Alkali-Activated Materials or Geopolymers**

F. Puertas, M.M: Alonso, S. Gismera, M. Lanzón and M.T. Blanco-Varela

MATEC Web of Conferences 149, 01002 (2018)

rheology of pastes , mortars and concretes prepared **with** siliceous **fly ash** as precursor , is comparable to

More

PDF (139 KB)

30. Open Access

Abdul Rahman Mohd Sam, Nur Farhayu Ariffin, Mohamed A. Ismail, Han Seung Lee and Mohd Azreen Mohd Ariffin
MATEC Web of Conferences 138, 01008 (2017)

M. W. Hussin, N. F. Ariffin, M. A. R. Bhutta, and N. H. A. S. Lim, “Study on Dry-Wet Cyclic Resistance of **Geopolymer** Mortars Using Blended **Ash** from Agro-Industrial Waste. In Proceeding of Third International Conference on Sustainable Construction Materials and Technologies”, August 2013, Kyoto, Japan (2013)

More

PDF (293 KB)

31. Open Access

en **The Application of PVA Fiber to Improve the Mechanical Properties of Geopolymer Concrete**

Muhammad Lutfi Manfaluthy and Januarti Jaya Ekaputri
MATEC Web of Conferences 138, 01020 (2017)

, **fly ash** has exquisite particle size . **Geopolymer** is formed from chemical reaction rather than hydration reaction like in Portland cement concrete based . **Geopolymer** concrete is well known to be brittle

More

PDF (490 KB)

32. Open Access

en **Studying the effect of thermal and acid exposure on alkali activated slag Geopolymer**

H.M. Khater
MATEC Web of Conferences 11, 01032 (2014)

Song, X. J.; Marosszeky; Brungs, M.; Munn, R., “Durability of **fly ash**-based **Geopolymer** concrete against sulphuric acid attack”. Paper presented at the10 DBMC International Conference on Durability of Building Materials and Components, Lyon, France, 2005.

More

PDF (4.934 MB)

33. Open Access

en **Feasibility and strength properties of the geopolymeric binder made of fly ash suspension**

Szymon Dawczyúski, Marek Soczyúski and Marcin GÓrski
MATEC Web of Conferences 262, 06001 (2019)

D. Hardjito, B.Y. Rangan, Development and Properties of Low-Calcium **Fly Ash**-based **Geopolymer** Concrete, Research Report GC1, Curtin University of Technology

OK

More

PDF (4.631 MB)

A.Z. Warid Wazien, Mohd Mustafa Al Bakri Abdullah, Rafiza Abd. Razak, Mohd M.A.Z. Remy Rozainy, Muhammad Faheem Mohd Tahir, M.A. Faris and Hazamaah Nur Hamzah

MATEC Web of Conferences 78, 01065 (2016)

, geopolymeric binders had very high bond strength even at early ages . **Fly ash** based **geopolymer** shows the

More

PDF (449.4 KB)

35. Open Access

en **A Comprehensive Review on the Properties of Coal Bottom Ash in Concrete as Sound Absorption Material**

Nurul Izzati Raihan Ramzi Hannan, Shahiron Shahidan, Noorwirdawati Ali and Mohamad Zulkhairi Maarof

MATEC Web of Conferences 103, 01005 (2017)

C. Arenas, L.F. Vilches, H. Cifuentes, C. Leiva, J. Vale and C. Fernández-pereira, Development of acoustic barriers mainly composed of co-combustion bottom **ash**, World Coal **Ash** Conf., (2011)

More

PDF (524 KB)

36. Open Access

en **Effect of elevated temperatures on alkali-activated tungsten mining waste based materials**

Rafael Silva-Figueiredo and João Castro-Gomes

MATEC Web of Conferences 274, 03001 (2019)

metakaolin or **fly ash** based geopolymers, making the information on geopolymers **with** mining waste mud almost inexistent. In this paper, were analysed geopolymers **with** different combinations of mining waste mud, waste

More

PDF (569.6 KB)

37. Open Access

en **Review on Characterization and Mechanical Performance of Self-cleaning Concrete**

Siti Norsaffirah Zailan, Norsuria Mahmed, Mohd Mustafa Al Bakri Abdullah, Andrei Victor Sandu and Noor Fifinatasha Shahedan

MATEC Web of Conferences 97, 01022 (2017)

Class C (high calcium **fly ash**) and Class F (low calcium **fly ash**). **Fly ash** are categorized under

More

PDF (1.099 MB)

Muhammad Talha Junaid, Amar Khennane and Obada Kayali
MATEC Web of Conferences 11, 01003 (2014)

N. A. Lloyd and B. V. Rangan, "**Geopolymer** Concrete **with Fly Ash**," presented at the Second International Conference on Sustainable Construction Materials and Technologies, Italy, 2010.

More

PDF (1.111 MB)

39. Open Access

en **A Review on the Manufacturing of Lightweight Aggregates Using Industrial By-Product**

Aiman Mahmad Nor, Zarina Yahya, Mohd Mustafa Al Bakri Abdullah, Rafiza Abdul Razak, Januarti Jaya Ekaputri, M. A. Faris and Hazamaah Nur Hamzah
MATEC Web of Conferences 78, 01067 (2016)

M.M.A.B. Abdullah, **Fly Ash** Porous Material using Geopolymerization Process for High Temperature Exposure. Int. J. Mol. Sci., 13, 4388 (2012).

More

PDF (621.9 KB)

40. Open Access

en **Deformational behaviour of fly-ash based geopolymer concrete at temperatures of up to 150°c**

M Talha Junaid
MATEC Web of Conferences 120, 02020 (2017)

Lloyd, N. and B. Rangan, **Geopolymer** Concrete **with Fly Ash**, in Second International Conference on Sustainable Construction Materials and Technologies: Italy.(2010)

More

PDF (1.16 MB)

41. Open Access

en **The Effect of HCWA-PFA Hybrid Geopolymer Modification on the Properties of Soil**

F.F. Hassian and C.C. Cheah
MATEC Web of Conferences 17, 01016 (2014)

Dermatas, D., & Meng, X. G. (2003) Utilization of **Fly Ash** for Stabilization Solidification of Heavy Metal Contaminated Soils. Engineering Geology, 70, p. 377–394.

More

PDF (547.5 KB)

42. Open Access

Hadipramana, Abdul Aziz Abdul Samad and Noridah Mohamad
MATEC Web of Conferences 103, 01006 (2017)

N. Ranjbar, M. Mehrali, U.J. Alengaram, H.S.C. Metselaar and Jumaat, Compressive strength and microstructural analysis of **fly ash**/palm oil fuel **ash** based **geopolymer mortar** under elevated temperatures. Construction and Building Materials, 65, 114–121 (2014)

More

PDF (95.5 KB)

43. Open Access

en **Production of Controlled Low Strength Material Utilizing Waste Paper Sludge Ash and Recycled Aggregate Concrete**
A. N. Azmi, M. A. Fauzi, M. D. Nor, A. R. M. Ridzuan and M. F. Arshad
MATEC Web of Conferences 47, 01011 (2016)

Production of Controlled Low Strength Material Utilizing Waste Paper Sludge **Ash** and Recycled Aggregate Concrete

More

PDF (1.177 MB)

44. Open Access

en **Design and Development of Green Eco-House**
Hassan Abdelrahman Ali Almed, Ku Nurasyiqin Binti Ku Amir, Wan Ahmad Zahran Arieff Bin Wan Zulkifli, Muhammad Nurshafiq Bin Ramli, Muhammad Farid Bin Mohd Salleh and Hamzah Bin Sakidin
MATEC Web of Conferences 38, 02006 (2016)

Rangan, V. (2010). Allied Publisher Private Limited: **Fly Ash** Based Geo-polymer Concrete, pp 68–106. Retrieved from http://www.uaecement.com/articles/ordinary_portland_cement.pdf

More

PDF (146.6 KB)

45. Open Access

en **Durability Quality Research of Concrete Containing Solar PV Cells**
Sao-Jeng Chao, An Cheng, Hui-Mi Hsu, Jia-Ruey Chang, Li-Wei Teng and Sung-Ching Chen
MATEC Web of Conferences 27, 01004 (2015)

L.W. Teng, R. Huang, H.M.Hsu, A. Cheng, J.R. Chang and P.H. Yu; Strength Quality Research of Cement **Mortar** Blended **with** Solar PV Cells, Adv. Mater. Res. 1025-1026 (2014) 1025–1030

More

PDF (90.30 KB)

46. Open Access

en **The role of microsilica in sustainable concrete**

collected from coal-fired

More

PDF (3.08 MB)

47. Open Access

en **Factors Affecting the Quality of Concrete Containing Solar PV Cells through Taguchi Method**

An Cheng, Hui-Mi Hsu, Sao-Jeng Chao, Jia-Ruey Chang, Li-Wei Teng and Sung-Ching Chen

MATEC Web of Conferences 27, 01005 (2015)

L.W. Teng, R. Huang, H.M. Hsu, A. Cheng, J.R. Chang and P.H. Yu; Strength Quality Research of Cement **Mortar** Blended **with** Solar PV Cells, Adv. Mater. Res. 1025-1026 (2014)1025–1030

More

PDF (75.09 KB)

48. Open Access

en **High-performance alkali-activated composites containing an iron-ore mine tailing as aggregate**

Raquel P. Batista, Juliana O. Costa, Paulo H. R. Borges, Flávio A. Dos Santos and Fernando S. Lameiras

MATEC Web of Conferences 274, 02004 (2019)

F. Škvára, T. Jílek, L. Kopecký, **Geopolymer** materials based on **fly ash**, Ceram. - Silikaty. 49(2005) 195-204.

More

PDF (1.179 MB)

49. Open Access

en **Towards the utilization of waste glass powder in sustainable cement based overlays**

Łukasz Sadowski

MATEC Web of Conferences 163, 03001 (2018)

composition of the concrete mix used to make the substrate . Portland cement CEM II A-LL 42,5 R **Fly ash** (FA

More

PDF (301.1 KB)

50. Open Access

en **Portland versus alkali-activated cement wall panels containing mine tailing as aggregate: one-story house thermal performance simulation in a Brazilian and Portuguese hot and humid climate**

Miriam O. Baumbach, Lucas T. S. Ramos, Raquel P. Batista, Raquel D. Oliveira and Paulo H. R. Borges

MATEC Web of Conferences 274, 03003 (2019)

PDF (485.3 KB)

1 2 Next >

MATEC Web of Conferences

eISSN: 2261-236X

Geopolymer Mortar with Fly Ash

Saloma[1,*], *Anis* Saggaff[1], *Hanafiah*[1], and *Annisa* Mawarni[1]

[1]Sriwijaya University, Jl. Palembang-Prabumulih, KM.32, Inderalaya, Ogan Ilir, South Sumatra, 30662, Indonesia.

Abstract. The cement industry accounts for about 7% of all CO_2 emissions caused by humans. Therefore, it is necessary to find another material in order to support sustainable material. An alternative way is replacing cement material with alternative material as fly ash. Fly ash as binder need to be added alkaline activator in the form of sodium silicate (Na_2SiO_3) or potassium silicate (K_2SiO_3) and sodium hydroxide (NaOH) or potassium hydroxide (KOH). The purpose of this research is to analyze the effect of activator liquid concentration on geopolymer mortar properties and to know the value of compressive strength. Molarity variation of NaOH are 8, 12, 14, and 16 M with ratio of Na_2SiO_3/NaOH = 1.0. Ratio of sand/fly ash = 2.75 and ratio of activator/fly ash = 0.8. The cube-shaped specimen 50 x 50 x 50 mm is cured by steam curing with a temperature of 60^oC for 48 hours. The experimental result of fresh mortar reported that the molarity of NaOH affect the slump flow and setting time, higher of NaOH produces the smaller value of slump and the faster time of setting. The experimental of density results reported that the increase of specific gravity when the molarity of NaOH increased. The experimental results of the compressive strength are showed that the maximum compressive strength of geopolymer mortar 14 M is 10.06 MPa and the lowest compressive strength produced by geopolymer mortar 8 M is 3.95 MPa. Testing the compressive strength of geopolymer mortar 16 M produces compressive strength lower than 14 M geopolymer mortar is 9.16 MPa.

1 Introduction

Nowadays, construction world has been shown a fair progress with the development of materials technology. One of the construction progress that had been developed was mortar. Mortar is the material used for building construction that is a mixture of fine aggregate, a binder, and water. Generally, the binder uses in mortar is cement.

Fly ash is wasting material which is produced by the power plant and it can be used as an alternative replacement of cement material. To be a binder, fly ash should be added with an alkaline activator as a catalyst of fly ash. Alkaline activator that commonly used in geopolymerization is a combination of sodium silicate (Na_2SiO_3) or potassium silicate (K_2SiO_3) and sodium hydroxide (NaOH) or potassium hydroxide (KOH) [1]. The ratio of K_2SiO_3 to KOH in order to produce high strength of geopolymer mortar is in the range 0.8

* Corresponding author: saloma_571@yahoo.co.id

to 1.5 [2]. The molarity of NaOH or KOH that can be used as an activator is in the range 8 M to 16 M [3, 4].

Based on the previous research, the writer has conducted a manufacture of geopolymer mortar with alkaline activator sodium silicate (Na_2SiO_3) and sodium hydroxide (NaOH) as the catalyst of fly ash. This research is also conducted to determine the properties of geopolymer mortar.

2 Material

This research was conducted in the Laboratory of Materials and Concrete, Civil Engineering Department, Faculty of Engineering, University of Sriwijaya. The specimen of this research was a cube-shaped size 50 x 50 x 50 mm with steam curing at a temperature of 60^oC for 48 hours. The variation of molarity, NaOH, which is used were 8, 12, 14, and 16 M with a ratio of Na_2SiO_3 / NaOH = 1.0. The ratio of sand / fly ash = 2.75 and the ratio of activator / fly ash = 0.8.

The material used in this research consists of fly ash where it came from power plant Tanjung Enim, South Sumatera, fine aggregate from Tanjung Raja, sodium hydroxide (NaOH) 98% purity flake, sodium silicate (Na_2SiO_3) with 58% of solid gel purity, and water. Material testing of this research are the physical properties of fine aggregate test and chemical analysis test of fly ash. The testing of chemical analysis was conducted in the Laboratory of PT.Semen Baturaja Palembang. The chemical composition of the chemical analysis of fly ash can be seen in Table 1. From the result, it showed that the compound of fly ash was classified into class F containing of $SiO_2 + Al_2O_3 + Fe_2O_3$ = 87.54% and the CaO content = 3.75%.

Table 1. The chemical composition of the fly ashes.

Chemical composition	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	LOI	IR
Percentage	82.04	3.70	1.80	3.75	0.01	0.08	3.50	78.97

Before producing mortar, first, it needed an activator solvent of NaOH and Na_2SiO_3 based on molarity needed. The solvent is made manually using a measuring cup and spatula. Then the solvent was allowed to stand for about 24 hours to achieve a homogenous solvent. The producing of fresh mortar is done by mixing fly ash and sand for 3 minutes. Then the activator solvent is added into the mixture of fly ash-sand and it is mixed for 10 minutes. Next, fresh mortar is filled into the mold in size 50 x 50 x 50 mm which has been smeared with lubricant oil. The filling process is done in two stages. Each stage of filling, 25 mm of concrete mix is filled then it's compacted. Then fresh mortar that has been moulded is cured with steam curing at temperature 60^oC for 48 hours.

3 Laboratory Test

This research conducted in Laboratory of Concrete and Material, Civil Engineering Faculty of Engineering, Universitas Sriwijaya. The standard for mortar mixed material refers to American Standart Testing and Material (ASTM C109). The experiment that has been conducted were workability, setting time, density and compressive strength test. The NaOH's molarity variation are 8, 12, 14 and 16 M with a ratio of Na_2SiO_3/NaOH = 1.0. Ratio of sand/fly ash = 2.75 and ratio of activator/fly ash = 0.8. The cube-shaped specimen 50 x 50 x 50 mm is cured by steam curing with a temperature of 60^oC for 48 hours. The

workability test conducted by test the flow table to know the diameter distribution. While the compressive strength test conducted using a 50 x 50 x 50 mm cube-sized material for 3, 7, 14, 21 and 28 days period.

4 Result and Analysis

4.1 Slump Flow

The result of slump flow test has a different value for each composition based on the molarity of NaOH. The result of slump flow can be seen in Figure 1. Based on the result of slump flow test it can be concluded that the greater molarity value of NaOH, the smaller slump value will be resulted. It causes due to the influence of molarity on the viscosity of activator solvent can influence the workability of the mixture.

4.2 Setting time

The result of setting with any variations of NaOH molarity can be seen in Figure 2. The result of setting time showed that the molarity of NaOH is greatly affected the setting time of geopolymer mortar. The greater value of NaOH molarity, the faster setting time is needed and vice versa the smaller value of NaOH molarity, the longer setting time is needed.

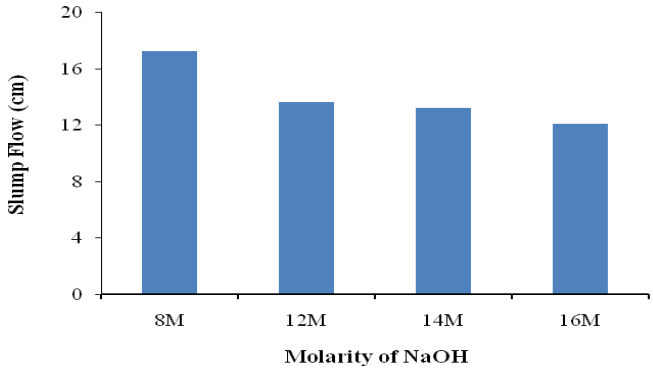

Fig. 1. The result of slump flow.

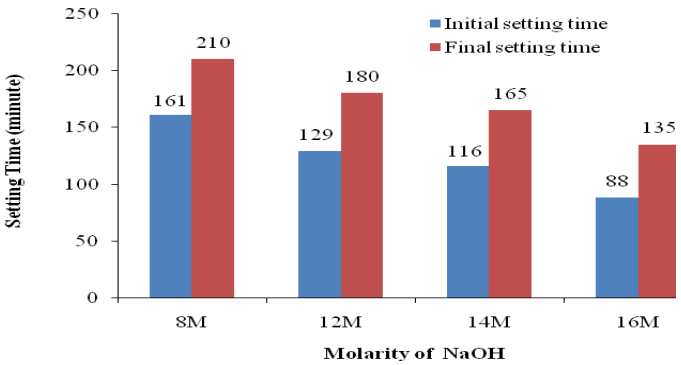

Fig. 2. The result of setting time.

4.3 Density

The test of density is tested before the test of compressive strength conducted. The data is obtained by weighing the weight of the specimen. The result of mortar geopolymer density can be seen in Figure 3. Based on the test, it can be explained that the greater value of NaOH molarity, the greater value of density is obtained. Mortar with the lowest molarity has more porous so it has a lower density than mortar with higher molarity. The result of density geopolymer mortar has a lower density than cement mortar is between range 2.17 to 2.19 gr/cm^3 [5, 6].

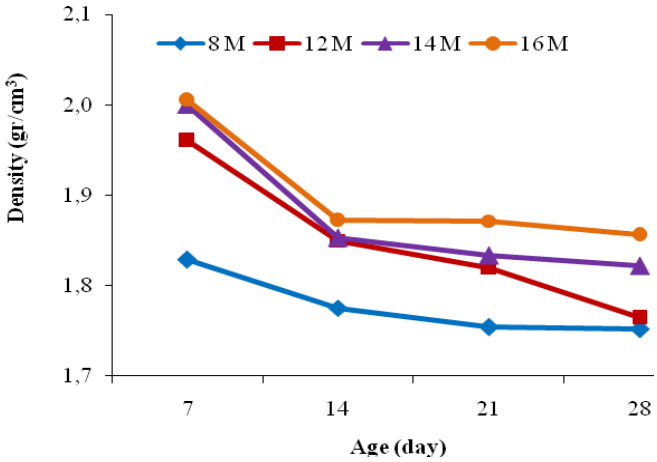

Fig. 3. The result tests of density.

4.4 Compressive Strength

The result of testing on each variation of NaOH molarity for aged 7, 14, 21, and 28 days can be seen in Figure 4. The minimum result of mortar compressive strength for aged 28 days is obtained by 8 M of mortar geopolymer with 3.95 MPa. The maximum compressive strength for 28 days is produced by mortar 14 M in the amount of 10.06 MPa. The compressive strength of geopolymer mortar 16 M resulting lower than geopolymer mortar NaOH 14 M.

The maximum compressive strength which is produced by geopolymer mortar 14 M is lower than the compressive strength of cement mortar type S according to ASTM C1329-03. The compressive strength of cement mortar type S which is required by ASTM C 1329-03 for 7 days and 28 days are 9.0 MPa and 14.5 MPa. The difference of compressive strength between geopolymer mortar and cement mortar is 30,62%.

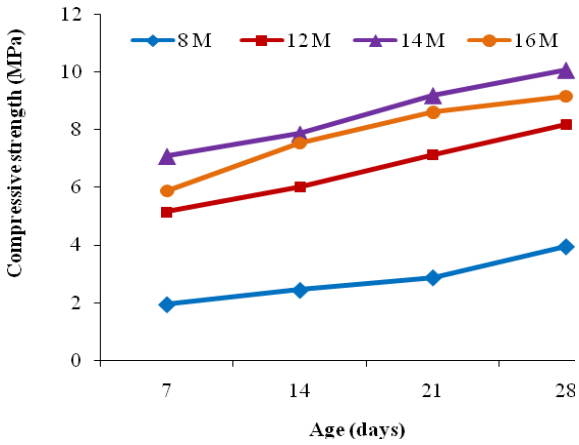

Fig. 4. The result of mortar compressive strength.

4.5 Regression Analysis of Mortar Compressive Strength

Regression analysis used the maximum result of compressive strength generated by geopolymer mortar 14 M. Regression analysis of the compressive strength of geopolymer mortar for various age testing refers to the equations recommended by ACI 209.2R-08. Regression analysis of the compressive strength of geopolymer mortar based on the compressive strength of mortar ACI 209.2R-08 can be seen in Figure 5.

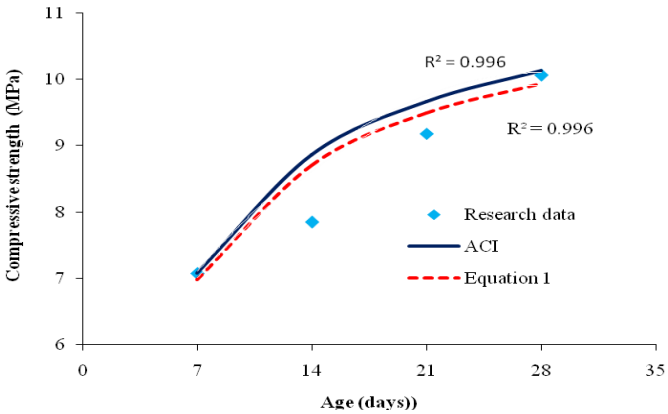

Fig. 5. Regression analysis of mortar compressive test.

The function used to determine the compressive strength for various age of this research can be seen in Equation 1.

$$f_c{}'_t = \left[\frac{t}{4{,}35 + 0{,}88.t}\right] f_c{}'_{28} \qquad (1)$$

The coefficient of determination R^2 = 0.9966. The value of R^2 which is close to 1 indicates that the regression analysis approach is good at accuracy.

5 Conclusion

The conclusion that can be drawn based on the results of research on the effects Na_2SiO_3 and NaOH on the properties of geopolymer mortar are as follows

- The greater the molarity of NaOH, the smaller value of slump flow obtained, thereby it reduces the workability of the mixture. The smaller value of molarity NaOH, the greater value of slump flow obtained that improve the workability of the mixture.
- The greater the molarity of NaOH, the faster setting time needed.
- The greater the molarity of NaOH, the greater the density of geopolymer mortar obtained
- The result of compressive strength showed that the maximum value is obtained on geopolymer mortar 14 M in the amount of 10.06 MPa and the minimum value is obtained on geopolymer mortar 8 M which is equal to 3.95 MPa. In mortar mixture of 16 M, it decreases the compressive strength equal to 9.16 MPa. Based on these result, it can be concluded that the optimum mixture to get the maximum strength is used NaOH 14 M.
- The result of regression analysis is based on ACI 209.2R-08 can be drawn that the coefficient of determination R^2= 0.9966. Based on R^2 it can be concluded that the testing of geopolymer mortar is fairly reached good accuracy.
- The result of compressive strength of geopolymer mortar is lower than cement mortar type S according to ASTM C 1329-03.

This work was financially supported by the DIPA Sriwijaya University 2015.

References

1. D. Hardjito, Journal-American Concrete Institute, **101(6)**, 467 (2004)
2. D. Hardjito, S.S. Fung, Modern Applied Science, **4(1)**, 44 (2010)
3. D. Hardjito, S.S.E. Asia, Modern Applied Science, **2**, 3 (2008)
4. D. Hardjito, M. Tsen, *The 3rd International Conference ACF/VCA*, **2003**, 144 (2008)

KEMENTERIAN RISET, TEKNOLGI, DAN PENDIDIKAN TINGGI
UNIT PENELITIAN DAN PENGABDIAN
PADA MASYARAKAT DAN KERJASAMA
FAKULTAS TEKNIK UNIVERSITAS SRIWIJAYA
Jln. Raya Prabumulih KM. 32 Inderalaya (306620) Telp. (0711) 580739-580741 Fax (0711) 580062
e-mail : ftunsri@plasa.com

REGISTRASI MATEC WEB OF CONFERENCES

Sesuai dengan data yang ada pada kami, maka tulisan dengan judul :

- Geopolymer mortar with fly ash

Penulis : **Dr. Ir. Hanafiah, MS**

Telah teregistrasi dengan No.

NOMOR REGISTRASI

0	3	0	1	0	8	0	4	1	6	0	1	0	1	1	5	3	8
Kode Fakultas		Kode PS/Jurusan		Kode Publikasi		Kode Penulis		Tahun Publikasi		Kode Sumber Tulisan		Sumber Dana		Nomor urut Publikasi dan Fakultas			

Inderalaya, 27 Juli 2018
Ketua,
Unit PPMK FT. UNSRI

Ir. H. Abdullah Saleh MS. M.Eng
NIP. 195304261984031001