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Synthesis of Zeolite from Coal Fly Ash by Seawater Hydrothermal Process at High Temperature

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Dr. Upita Septiani

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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Synthesis of Zeolite from Coal Fly Ash by Seawater Hydrothermal Process at High Temperature

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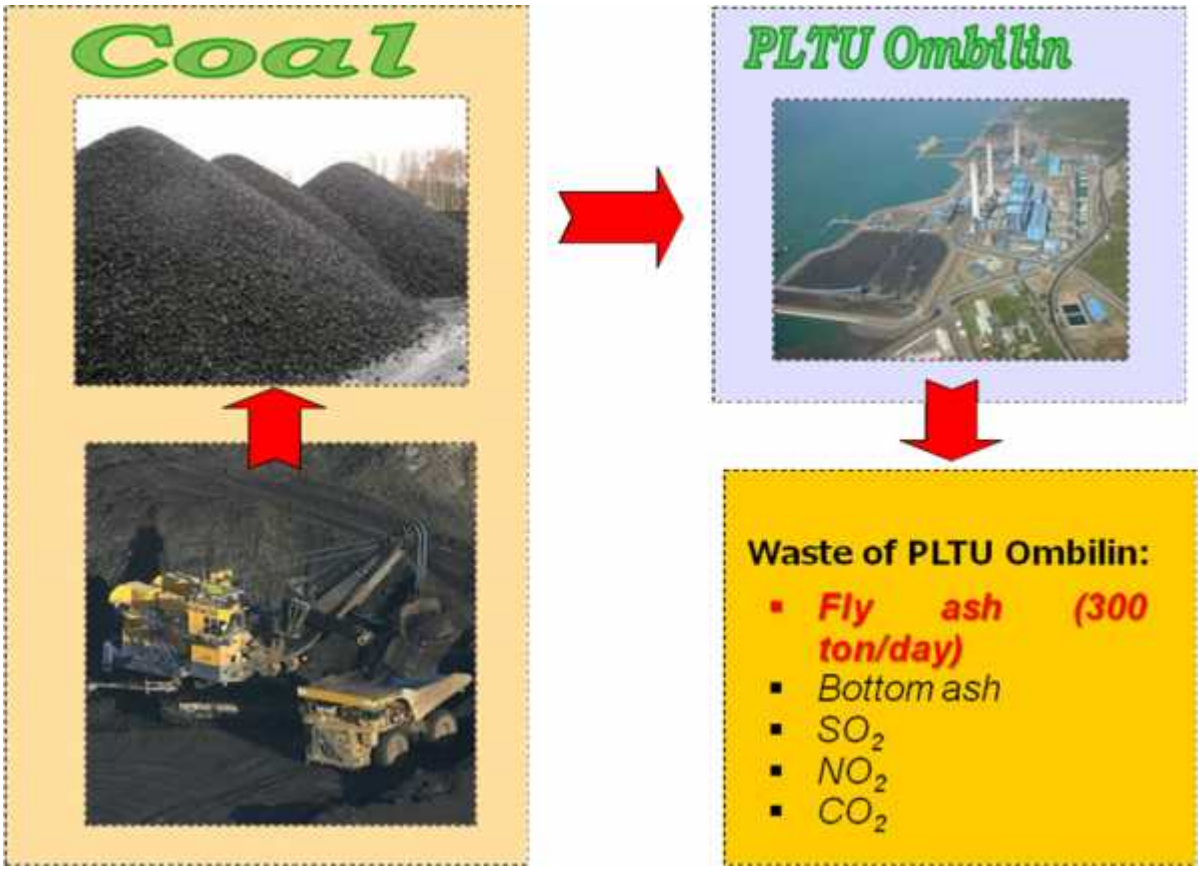
ABSTRACT

Zeolitic materials were prepared from PLTU Ombilin coal fly ash by hydrothermal synthesis method at pH 14 and seawater as a solvent, the crystallization was canducted at high temperature 150^{o}C for different times (6, 12, 18 and 24 hours). The zeolitic material obtained was characterized by X-ray diffraction (XRD), Fourier transformed infrared (FT-IR) spectroscopy, and has charateristics of zeolite sodalite (SOD), a detailed morphological characterization of synthesis products with Scanning electron microscopy (SEM) was carried out to investigate crystal morphology of SOD zeolites.

Keywords: fly ash, zeolite, Sodalite

Introduction



Fly Ash

Fly Ash of PLTU Ombilin :

- 51.8% SiO_2
- 26.9% Al_2O_3
- 0.7% MgO
- 2% CaO
- 5.1% Fe_2O_3

Zeolite applications :

- ❑ Absorbent
- ❑ Catalyst
- ❑ Ion Exchanger

Zeolite ($M_{2/n}O.Al_2O_3.{}_ySiO_2.{}_wH_2O$

Porous crystalline aluminosilikat

Of SiO_4^{4-} and AlO_4^{5-} tetrahedral

Cor

Previously Research

1. Belviso (2009) have synthesized zeolite from coal fly ash (Italia) by hydrothermal process with seawater as solvent at low temperature 60°C and incubation time **4 days**. Zeolites obtained were NaX zeolites

2. Upita (2013-2014)) have synthesized zeolite from coal fly ash (PLTU Ombilin) by hydrothermal process with seawater as solvent at low temperature 60°C and incubation time **4 days**. Zeolites obtained were sodalite zeolites

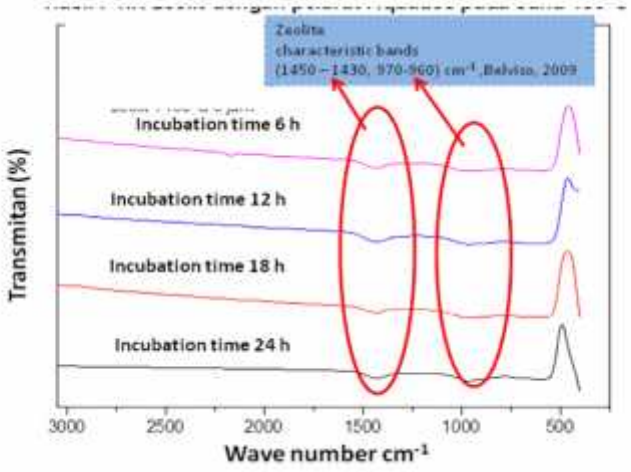
Purpose

- To study the synthesis of zeolite from coal fly ash by seawater hydrotermal process at high temperature (150°C) and with varying incubation times (6, 12, 18 and 24) h.

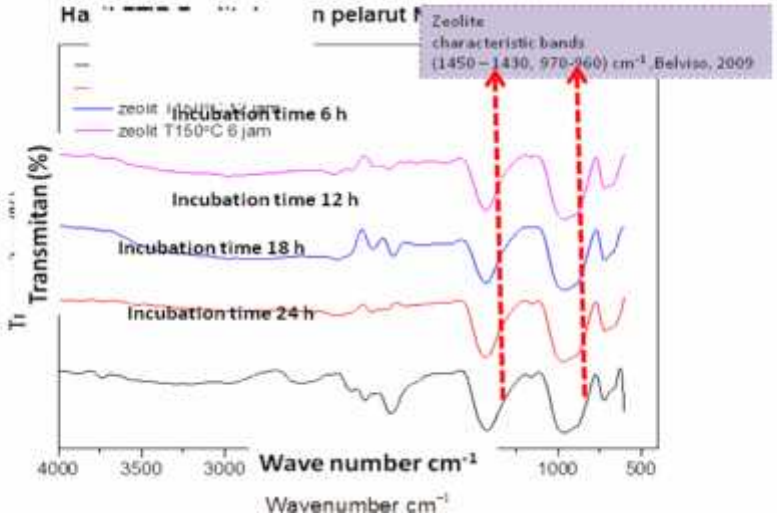
- To investigate the effect of aquades and seawater as solvent in synthesis of zeolite from coal fly ash by hydrothermal method at the high temperature

Results and Discussion

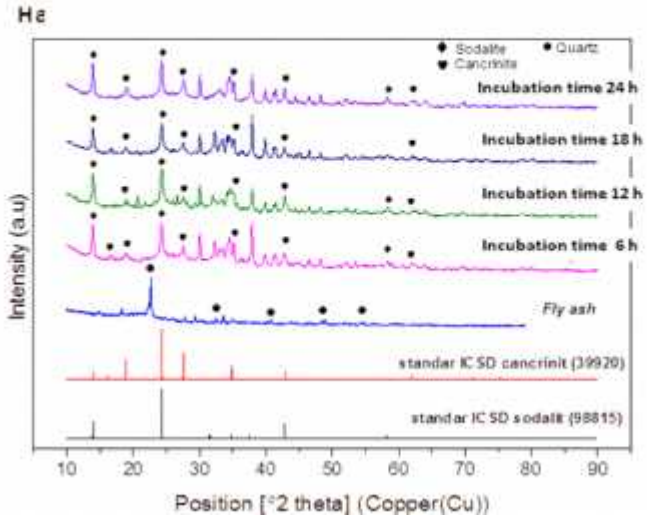
FT-IR spectra of zeolite obtained by hydrothermal process at 150°C, incubation time (6, 12, 18 and 24)h with aquades as solvent



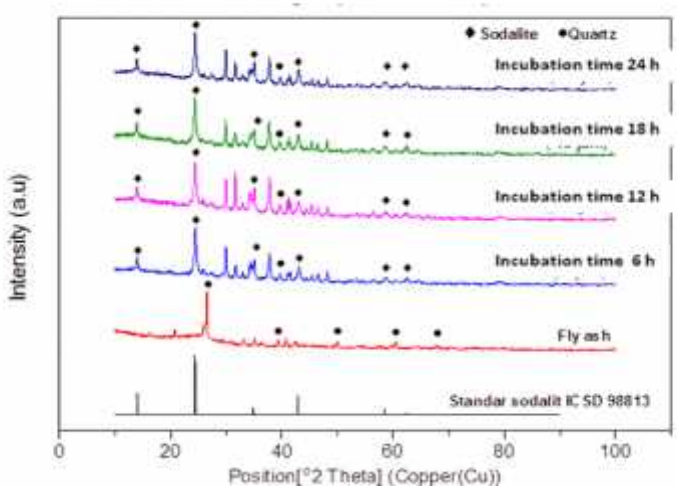
FT-IR spectra of zeolite obtained by hydrothermal process at 150°C, incubation time (6, 12, 18 and 24)h with seawater as solvent



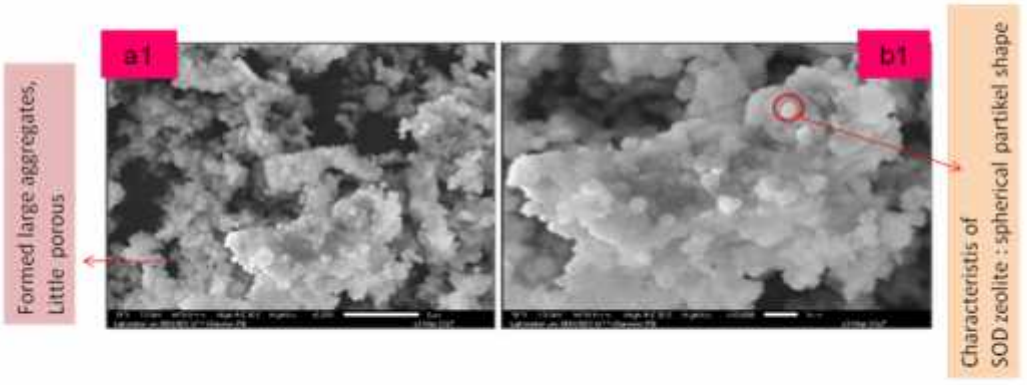
XRD patterns of zeolite obtained by hydrothermal process at 150°C with aquades as solvent



XRD patterns of zeolite obtained by hydrothermal process at 150°C with seawater as solvent



SEM images of zeolite obtained by seawater hydrothermal process at temperature 150°C and incubation time 6 hours



SEM images of Sodalite (SOD) zeolite (a1) 5000x , (b1) 10000x

Conclusion

- ✓ We successeefully prepared the zeolite from coal fly ash by seawater hydrothermal process at high temperature of 150°C and short incubation time 6 hours with seawater as a solvent
- ✓ The zeolite obtained was characterized by XRD, FT-IR and SEM and has characteristic of Sodalite (SOD) zeolite
- ✓ The formation of zeolite by seawater hydrothermal process is faster than aquades hydrothermal process at high temperature of 150°C and all incubation time of (6, 12, 18 and 24) hours

References

Belviso, C., Cavalcante, F., Lettino, A., Fore, S., 2009, Zeolite synthetesised from Fused Coal Fly Ash at Low Temperature Using Sea Water for Crystalization, *Coal Combustion and Gasification Product*, vol. 1(1), pg.8-13

Charles, B., Totok, E.S., 2010, Adsorpsi Amonia oleh Adsorben Zeolit Alam yang Diaktivasi dengan Lartan Amonium Nitrat, *Jurnal Gradien*, vol. 4(2), hal. 354-360

Cosoli, P., Ferrone, M., Pricl, S., Fermeglia, M., 2008, Hydrogen Supplied Removal from Biogas by Zeolite Adsorbtion Part I GCMC Molecular Simolations, *Chemistry Enginering Journal*, vol. 145(2), pg. 86-92.

Dimitar, G., Bogdan, B., Krasimira, A., 2009, Synthetic Zeolite-Structure, Clasification, Current Trends In Zeolite Synthesis, *International Science Converence*, London.

Flanigen, E.M., 1990, Molecular Sieve Zeolite Technology-the First Twenty-Five Years, *Pure Apply Chem*, vol. 52(1), pg. 2191-2211.

Fuoco., Domenico., 2012, A New method for Characterization of Natural Zeolite and Organic Nanostructure Using Atomic Force Microscopy, *Journal Nanomaterials*, Vol. 10(1), pg. 91-97.

Murniati., Nurul, H., Mudasir., 2009, Pemanfaatan Limbah Abu Dasar Batubara Sebagai Bahan Dasar Sintesis Zelite dan Aplikasinya Sebagai Adsorben Logam Berat Cu (II), *Prosiding Seminar Nasional Penelitian, Pendidikan dan Penerapan MIPA*, Yogyakarta.

Shaila., Khadse, P., Patil, V., Deepa, Panhekar, 2015, Zeolite as Adsorbent for the Removal of Nikel, *Research Journal of Recent Science*, vol. 4(3), pg. 48-51.

Sunardi., Abdullah., 2007, Conversion of Coal Fly Ash Into Zeolite and Its Aplication for Mercury (II) Adsorbent, *Sains dan Terapan Kimia,* vol. 1(1), hal. 1-10.

Supriatno dan Lelifajri, 2009, Analisis Logam Berat Pb dan Cd dalam Sampel Ikan dan Kerang secara Spektofotometri Serapan Atom, *Jurnal Rekayasa Kimia dan Lingkungan*, vol. 7(1), hal. 5-8.

Sutarti, M., Rachmawati,1994, Zeolit Tinjauan Literatur, Pusat Dokumentasi dan Informasi LIPI, Jakarta.

Septiani, U., Fajri., Adriany, R., 2015, Aplikasi Zeolit NaX yang Disintesis dari Abu terbang PLTU Ombilin untuk Penyerapan Gas CO_2, *Jurnal Kimia Unand,* vol. 4(1), hal. 16-23.

Septiani, U., Fatiha, W.Y ., Arief, S., 2015, Sintesis dan Karakterisasi Zeolit Faujasit dari Limbah Batubara Ombilin dengan Metoda Alkali Hidrotermal Air Laut, *J. Ris. Kim*, vol. 8(2), hal. 167-171.

Septiani, U., Jamarun, N., 2016, Synthesis of Zeolite ZMS-5 from Rice Husk Ash as Catalyst in Vegetable Oil Transesterification for Biodisel Production, Journal of Der Pharmacia Lettre, vol. 8(19), pg. 86-91.