

**UJI ADSORPSI ZEOLIT HASIL SINTESIS DARI ABU LAYANG
TERHADAP ION POSFAT**

SKRIPSI

Diajukan untuk memenuhi sebagian persyaratan untuk memperoleh Gelar Sarjana
Sains di Bidang Kimia



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Uji Adsorpsi Zeolit Hasil Sintesis Dari Abu Layang Terhadap Ion Posfat

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Sebuah skripsi yang diajukan untuk memenuhi sebagian persyaratan memperoleh Gelar Sarjana Sains pada Fakultas Pendidikan Matematika Dan Ilmu Pengetahuan Alam

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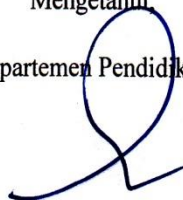
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ABSTRAK

Abu layang (*Fly ash*) merupakan salah satu limbah padat hasil pembakaran batubara. Meningkatnya penggunaan batubara untuk kepentingan industri di dalam negeri menyebabkan limbah padat berupa abu layang dan abu dasar semakin menumpuk. Abu layang telah digunakan sebagai aditif di industri semen, hanya saja penggunaannya masih belum optimal. Kandungan utama dari abu layang adalah mineral alumina dan silikat yang merupakan bahan dasar dalam pembuatan zeolit. Pada penelitian ini, abu layang disintesis menjadi zeolit dengan menggunakan metode refluks yang diikuti pemanasan pada suhu 90°C. Refluks dilakukan untuk mereaksikan abu layang dengan larutan alkali (NaOH 2M) yang dilakukan pada suhu 150°C selama 1 jam. Setelah direfluks, sampel dipanaskan dalam oven selama 24 jam dengan suhu 90°C. Zeolit hasil sintesis dianalisis menggunakan FTIR, XRD, XRF, BET, dan SEM. Hasil karakterisasi dengan menggunakan FTIR menunjukkan adanya vibrasi stretching Si-O-Si atau Al-O-Al pada tetrahedral $[\text{SiO}_4]^{4-}$ atau $[\text{AlO}_4]^{5-}$ pada serapan 985 cm^{-1} , vibrasi stretching Al-O-Si pada 663 cm^{-1} , dan Vibrasi bending Al-O atau Si-O pada 455 cm^{-1} . Hasil analisis BET menunjukkan bahwa luas permukaan abu layang adalah $6,9\text{ m}^2/\text{g}$ dan mengalami peningkatan setelah disintesis menjadi zeolit yaitu $34,1\text{ m}^2/\text{g}$. Hasil analisis XRD menyatakan bahwa material mengandung natrium aluminum silikat hidrat yang merupakan zeolite sodalit (JCPDS Card No. 31-1271), kalsit dan kuarsa. Uji adsorpsi dilakukan dengan menggunakan larutan posfat yang diukur dengan menggunakan spektrofotometer UV-Vis menggunakan metode Fardiaz. Adsorpsi ion posfat diujikan dengan model isoterm Langmuir dan Freundlich. Kapasitas adsorpsi posfat sebesar $11,8\text{ mg/g}$ pada waktu kontak optimum selama 25 menit. Berdasarkan data korelasi (R^2) yang didapat, data adsorpsi tersebut mengikuti persamaan isoterm adsorpsi Freundlich.

Kata Kunci: Zeolit, Abu layang, adsorpsi, ion posfat.

ABSTRACT

Fly ash is a solid waste produced on coal combustion. The necessity growth of coal use in industry materiality in Indonesia country causes the solid waste in the form of fly ash and bottom ash produced on the combustion. Fly ash had been used as an additive in cement industry although it is not so optimal. The main elements of Fly ash are mineral alumina and silicates, they are the basic materials in zeolite production. This research aims to study how fly ash is synthesized to be zeolite with reflux methods which is followed by in 90°C. Reflux is performed to establish a reaction fly ash with an alkaline solution (NaOH 2M) in 150°C during one hour. Afterwards, the sample is heated in an oven during 24 hours in 90°C. The Zeolite synthesized product is then analyzed by using FTIR, XRD, XRF, BET, and SEM. The characterization result by using FTIR shows the indication of Si-O-Si or Al-O-Al stretching vibration in tetrahedral $[\text{SiO}_4]^{4-}$ or $[\text{AlO}_4]^{5-}$ on 985 cm^{-1} absorption, Al-O-Si stretching vibration on 663 cm^{-1} , Al-O or Si-O bending vibration on 455 cm^{-1} . Meanwhile, the BET analysis shows that the fly ash's surface area is $6.9\text{ m}^2/\text{g}$ increased after becoming zeolite into $34.1\text{ m}^2/\text{g}$. Subsequently, the XRD analysis clarifies that the material contains sodium aluminum silicate hydrate which are sodalite zeolite (JCPDS Card No. 31-1271), calcite, and quartz. The absorption was done by using phosphate solution measured by UV-Vis spectrophotometer adopting Fardiaz method, tested by isotherm model of Langmuir's and Freundlich's. The capacity of phosphate absorption is 11.8 mg/g in 25 minutes optimum contact time. Based on the obtained correlation data (R^2), the absorption data follows Freundlich's equation data of isotherm equation.

Keywords: Zeolite, Fly ash, adsorption, phosphate ion.

DAFTAR ISI

| | |
|--|-------------------------------------|
| ABSTRAK | 38 |
| ABSTRACT | 39 |
| KATA PENGANTAR..... | Error! Bookmark not defined. |
| UCAPAN TERIMA KASIH | Error! Bookmark not defined. |
| DAFTAR ISI..... | 40 |
| DAFTAR TABEL | 42 |
| DAFTAR GAMBAR..... | 43 |
| DAFTAR LAMPIRAN | 44 |
| BAB I..... | Error! Bookmark not defined. |
| PENDAHULUAN..... | Error! Bookmark not defined. |
| 1.1 Latar Belakang | Error! Bookmark not defined. |
| 1.2 Rumusan Masalah Penelitian | Error! Bookmark not defined. |
| 1.3 Tujuan Penelitian | Error! Bookmark not defined. |
| 1.4 Manfaat Penelitian | Error! Bookmark not defined. |
| 1.5 Batasan Penelitian | Error! Bookmark not defined. |
| 1.6 Struktur Organisasi Skripsi | Error! Bookmark not defined. |
| BAB II | Error! Bookmark not defined. |
| TINJAUAN PUSTAKA | Error! Bookmark not defined. |
| 2.1 Abu Layang (<i>Fly Ash</i>) | Error! Bookmark not defined. |
| 2.2 Zeolit | Error! Bookmark not defined. |
| 2.3 Metode Sintesis Zeolit dari Abu Layang.. | Error! Bookmark not defined. |
| 2.4 Karakterisasi Zeolit..... | Error! Bookmark not defined. |
| 2.4.1 <i>Fourier Transform Infrared Spectroscopy</i> (FTIR).. | Error! Bookmark not defined. |
| 2.4.2 <i>X-Ray Fluorescence</i> (XRF)..... | Error! Bookmark not defined. |
| 2.4.3 <i>X-Ray Diffraction</i> (XRD) | Error! Bookmark not defined. |
| 2.4.4 <i>Scanning Electron Microscopy</i> (SEM) Error! | Bookmark not defined. |
| 2.4.5 Analisis Area Permukaan Dengan Menggunakan Metode | |
| Brunauer-Emmet-Teller (BET)..... | Error! Bookmark not defined. |
| 2.5 Aplikasi Zeolit Hasil Sintesis dari Abu Layang sebagai Adsorben | Error! |
| Bookmark not defined. | |
| 2.6 Isoterm Adsorpsi | Error! Bookmark not defined. |
| BAB III..... | Error! Bookmark not defined. |
| METODE PENELITIAN | Error! Bookmark not defined. |

| | |
|--|-------------------------------------|
| 3.1 Waktu dan Lokasi Penelitian | Error! Bookmark not defined. |
| 3.2 Alat dan Bahan | Error! Bookmark not defined. |
| 3.2.1 Alat | Error! Bookmark not defined. |
| 3.2.2 Bahan | Error! Bookmark not defined. |
| 3.3 Tahapan Penelitian..... | Error! Bookmark not defined. |
| 3.4 Prosedur Penelitian | Error! Bookmark not defined. |
| 3.4.1 Preparasi Bahan Baku Abu Layang .. | Error! Bookmark not defined. |
| 3.4.2 Sintesis Zeolit dari Abu Layang | Error! Bookmark not defined. |
| 3.4.3 Uji Adsorpsi Zeolit hasil sintesis terhadap Ion Posfat..... | Error! Bookmark not defined. |
| 3.5 Prosedur Analisis Instrumen..... | Error! Bookmark not defined. |
| 3.5.1 Analisis Gugus Fungsi Material menggunakan FTIR | Error! Bookmark not defined. |
| 3.5.2 Analisis Komposisi Material dengan menggunakan XRF | Error! Bookmark not defined. |
| 3.5.3 Analisis Fasa Kristal dengan XRD..... | Error! Bookmark not defined. |
| 3.5.4 Analisis Profil Permukaan Material dengan SEM | Error! Bookmark not defined. |
| 3.5.5 Analisis Area Permukaan dengan metode BET..... | Error! Bookmark not defined. |
| 3.5.6 Analisis Kadar Ion Posfat dengan Spektrofotometer UV-Vis. | Error! Bookmark not defined. |
| BAB IV | Error! Bookmark not defined. |
| TEMUAN DAN PEMBAHASAN..... | Error! Bookmark not defined. |
| 4.1 Preparasi Bahan Baku Abu Layang | Error! Bookmark not defined. |
| 4.2 Sintesis Zeolit Berbasis Abu Layang | Error! Bookmark not defined. |
| 4.3 Uji Adsorpsi Zeolit terhadap Ion Posfat .. | Error! Bookmark not defined. |
| BAB V..... | Error! Bookmark not defined. |
| KESIMPULAN, IMPLIKASI DAN REKOMENDASI | Error! Bookmark not defined. |
| 5.1 Kesimpulan | Error! Bookmark not defined. |
| 5.2 Implikasi dan Rekomendasi | Error! Bookmark not defined. |
| DAFTAR PUSTAKA | Error! Bookmark not defined. |
| LAMPIRAN..... | Error! Bookmark not defined. |
| RIWAYAT HIDUP | Error! Bookmark not defined. |

DAFTAR TABEL

Tabel 2.1 Komposisi Kimia abu layang berdasarkan jenis batubaraError!
Bookmark not defined.

Tabel 4.1 Persentase Komponen Senyawa yang Terkandung dalam Abu LayangError! Bookmark not defined.

Tabel 4.2 Komposisi Kimia Abu Layang dan Zeolit hasil SintesisError!
Bookmark not defined.

Tabel 4.3 Hasil Analisis BET Abu Layang dan Zeolit Hasil SintesisError!
Bookmark not defined.

DAFTAR GAMBAR

- Gambar 2.1 Kerangka Struktur Zeolite (Zahrul M. *et al*, 2010).....Error!**
Bookmark not defined.
- Gambar 2.2 Cara Kerja FTIR (Road, 2001)Error!** Bookmark not defined.
- Gambar 2.3 Skema Kerja XRF (Gosseau, D., 2009).....Error!** Bookmark not defined.
- Gambar 2.4 Skema kerja XRD (Menik, 2010)Error!** Bookmark not defined.
- Gambar 2.5 Skema Kerja SEM (Hidayat, T, 2018).....Error!** Bookmark not defined.
- Gambar 3.1 Diagram Alir PenelitianError!** Bookmark not defined.
- Gambar 3.2 Bagan Alir Proses Preparasi Bahan Baku Abu LayangError!**
Bookmark not defined.
- Gambar 3.3 Bagan Alir Proses Sintesis ZeolitError!** Bookmark not defined.
- Gambar 3.4 Bagan Alir Uji Adsorpsi Zeolit terhadap Ion Posfat.....Error!**
Bookmark not defined.
- Gambar 4.1 Spektrum FTIR Abu LayangError!** Bookmark not defined.
- Gambar 4.2 Bentuk Fisik (a) Abu Layang dan (b) Zeolit hasil sintesis....Error!**
Bookmark not defined.
- Gambar 4.3 Spektrum FTIR Zeolit Hasil Sintesis dan Abu LayangError!**
Bookmark not defined.
- Gambar 4.5 Gambar SEM (a) Abu layang batubara perbesaran 1000x (b) Abu Layang batubara perbesaran 15.000x (c) Zeolit Hasil Sintesis Perbesaran 1000x (d) Zeolit Hasil Sintesis Perbesaran 20.000xError!**
Bookmark not defined.
- Gambar 4.6 Kurva optimasi waktu dengan kapasitas adsorpsiError!**
Bookmark not defined.
- Gambar 4.7 Kurva Isoterm LangmuirError!** Bookmark not defined.
- Gambar 4.8 Kurva isoterm FreundlichError!** Bookmark not defined.

DAFTAR LAMPIRAN

- Lampiran 1 Perhitungan**Error! Bookmark not defined.
- Lampiran 2 Karakterisasi FTIR Abu Layang dan Zeolit Hasil Sintesis ..**Error!
Bookmark not defined.
- Lampiran 3 Karakterisasi XRD Abu Layang dan Zeolit Hasil Sintesis ...**Error!
Bookmark not defined.
- Lampiran 4 Hasil analisis BET**Error! Bookmark not defined.
- Lampiran 5 Hasil Analisis XRF**Error! Bookmark not defined.
- Lampiran 6 Dokumentasi Penelitian.....**Error! Bookmark not defined.

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