

**ADSORPSI BENZENA DAN NAFTALENA PADA BAHAN MAGNETIK
PASIR BESI TERLAPIS SILIKA TERMODIFIKASI
AGEN HIDROFOBİK**

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INTISARI

Perilaku adsorpsi benzena dan naftalena di dalam air yang mewakili komponen cemaran minyak di perairan pada adsorben bahan magnetik pasir besi terlapis silika termodifikasi agen hidrofovik (BMPB@SiO₂/AH) telah dipelajari. Adsorben BMPB@SiO₂/AH disintesis dengan cara melapisi bahan magnetik pasir besi dengan silika termodifikasi agen hidrofovik melalui proses *sol-gel*. Larutan Na₂SiO₃, etanol dan senyawa hidrofovik organosilan ditambahkan pada bahan magnetik pasir besi yang telah diaktivasi dengan HCl. Proses sol gel dilakukan dengan menambahkan larutan HCl ke dalam campuran hingga mencapai pH 7.0. Senyawa organosilan yang digunakan adalah metiltrietoksisilan (MTES), felniltrietoksisilan (FTES) dan heksadesiltrimetoksisilane (HDTMS). Pengaruh rasio mol silika dan organosilan pada karakteristik adsorben telah dievaluasi. Karakterisasi produk dilakukan dengan *Fourier Transform Infrared Spectrophotometer* (FT-IR), *X-ray Diffraction* (XRD) dan *Scanning Electron Microscope-Energy Dispersive Spectroscopy* (SEM-EDS). Adsorben BMPB@SiO₂/AH diaplikasikan untuk adsorpsi senyawa benzena dan naftalena dalam system *batch* pada variasi waktu kontak dan konsentrasi adsorbat. Konsentrasi benzena dan naftalena sebelum dan sesudah adsorpsi dianalisis dengan spektrofotometer UV-Vis.

Hasil karakterisasi menunjukkan bahwa adsorben BMPB@SiO₂/AH telah berhasil disintesis. Adsorpsi benzena dan naftalena pada BMPB@SiO₂/AH mengikuti kinetika adsorpsi orde dua semu dan isoterm adsorpsi Freundlich. Kapasitas adsorpsi maksimum benzena pada BMPB@SiO₂/MTES, BMPB@SiO₂/FTES dan BMPB@SiO₂/HDTMS menunjukkan nilai yang tinggi berturut-turut 84; 91 dan 100 mg/g, sementara terhadap naftalena berturut-turut 24; 28 and 51 mg/g. Nilai tersebut menunjukkan adsorben BMPB@SiO₂/AH memiliki potensi yang tinggi untuk diterapkan pada adsorpsi cemaran minyak di perairan.

Kata kunci: adsorpsi, benzena, naftalena, BMPB@SiO₂/AH, silika.

ADSORPTION OF BENEZENE AND NAPHTHALENE ON IRON SAND MAGNETIK MATERIAL COATED WITH HYDROPHOBIC MODIFIED SILICA

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ABSTRACT

Adsorption characteristics in water of benzene and naphthalene as representatives of petroleum oil components on iron sand magnetic particle coated hydrophobic-silica (BMPB@SiO₂/AH) has been investigated. The initial works was synthesis of BMPB@SiO₂/AH by coating iron sand with hydrophobic groups modified silica through sol-gel process. Iron sand were added with Na₂SiO₃ solution, ethanol and hydrophobic organosilane. The *sol-gel* process was performed by adding HCl solution in the mixture to reach pH of 7.0. The organosilanes used were methyltriethoxysilane (MTES), phenyltriethoxysilane (PTES) and hexadecyltrimethoxysilane (HDTMS); and the effect of mole ratio of silica to organosilane on the product characters was evaluated. The products were characterized by Fourier Transform Infrared Spectrophotometer (FT-IR), X-ray Diffraction (XRD) and Scanning Electron Microscope-Energy Dispersive Spectroscopy (SEM-EDS). The products were used to adsorb benzene and naphthalene from aqueous solution in a batch system at various contact time and concentration. The concentration before and after adsorption of benzene and naphthalene in the solution was analyzed by ultra-violet spectrophotometer.

The result of the characterization showed that BMPB@SiO₂/AH was successfully produced. The adsorption of the benzene and naphthalene on BMPB@SiO₂/AH followed a kinetics model of pseudo-second order and Freundlich isotherm adsorption. The maximum capacity of benzene on BMPB@SiO₂/MTES, BMPB@SiO₂/FTES and BMPB@SiO₂/HDTMS showed highly values, namely 84, 91 and 100 mg/g, respectively; and 24; 28 and 51 mg/g, respectively for naphthalene. Those values lead to highly potential of the adsorbents to be applied for removal of petroleum pollutants from the aquatic environments.

Keywords : adsorption, benzene, hydrophobic-silica, naphthalene,
BMPB@SiO₂/AH.