

ZEOLIT ALAM TERMODIFIKASI SETILTRIMETILAMONIUM BROMIDA UNTUK ADSORPSI SENYAWA ANILIN DAN 1-NAFTOL DALAM AIR

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INTISARI

Pada modifikasi zeolit alam dengan surfaktan Cethyltrimethylammonium Bromide (CTAB), telah dipelajari kapasitas adsorpsi dan model isoterm adsorpsi senyawa anilin dan 1-naftol pada zeolit termodifikasi CTAB (Z-CTAB). Modifikasi dilakukan melalui pembentukan lapisan tunggal (*monolayer*) surfaktan CTAB pada permukaan eksternal zeolit. Penelitian ini dimulai dengan aktivasi zeolit alam (ZA) menggunakan HCl 3 M menghasilkan zeolit alam teraktivasi (ZAA). Dalam penelitian ini dilakukan pada variasi waktu adsorpsi selama 30, 60, 90, 120, 150, 180, dan 210 menit, serta variasi adsorbat pada konsentrasi 10, 20, 30, 40, dan 50 mg L⁻¹. Keberhasilan aktivasi dan modifikasi zeolit alam dikarakterisasi dengan Spektroskopi Inframerah Transformasi Fourier, Difraksi Sinar X, dan *Scanning Electron Microscope-Energy Dispersive Spectroscopy (SEM-EDS)*. Penentuan kapasitas adsorpsi senyawa anilin dan senyawa 1-naftol menggunakan spektrofotometer UV-Vis.

Hasil penelitian menunjukkan bahwa kapasitas adsorpsi Z-CTAB terhadap senyawa anilin dan 1-naftol lebih tinggi dibandingkan dengan kapasitas adsorpsi dari ZA dan ZAA. Adsorpsi anilin dan 1-naftol pada Z-CTAB terjadi secara fisisorpsi dan mengikuti pola isoterm Freundlich dengan kapasitas adsorpsi terhadap senyawa anilin dan senyawa 1-naftol masing-masing sebesar $1,56 \times 10^{-3}$ mol g⁻¹ dan $1,76 \times 10^{-3}$ mol g⁻¹. Aktivitas adsorpsi anilin dan 1-naftol optimal pada adsorben dengan urutan Z-CTAB > ZAA > ZA dan kapasitas adsorpsi Z-CTAB terhadap senyawa 1-naftol > kapasitas adsorpsi Z-CTAB terhadap senyawa anilin.

Kata kunci: adsorpsi, anilin, 1-naftol, zeolit.

CETYLTRIMETHYLAMMONIUM BROMIDE MODIFIED NATURAL ZEOLITE FOR ADSORPTION OF ANILINE AND 1-NAPHTHOL IN WATER

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ABSTRACT

In the modification of natural zeolites with cetyltrimethylammonium bromide (CTAB), adsorption capacity and adsorption isotherms of surfactant modified zeolites (Z-CTAB) for aniline and 1-naphthol adsorption were studied. The modification was performed by monolayer form of CTAB surfactant on external surfaces of zeolite. This research was started by activation of natural zeolite (ZA) using HCl 3 M to form activated natural zeolite (ZAA). The variation of time was performed by varying the time of adsorption on 30, 60, 90, 120, 150, 180, and 210 minutes and adsorbate concentration in 10, 20, 30, 40, and 50 mg L⁻¹. The success of activation and modification of natural zeolite were characterized by Fourier-Transform Infrared (FTIR), X-Ray Powder Diffraction (XRD), and Scanning Electron Microscope-Energy Dispersive Spectroscopy (SEM-EDX). Adsorption of aniline and 1-naphthol were analyzed using UV-Vis spectrophotometer.

The result showed that Z-CTAB adsorption capacity for aniline compound and 1-naphthol was higher than ZA and ZAA. The adsorption of aniline compound and 1-naphthol compound on Z-CTAB was physisorption and following Freundlich isotherm of adsorption with capacity for aniline and 1-naphthol were $1.56 \times 10^{-3} \text{ mol g}^{-1}$ and $1.76 \times 10^{-3} \text{ mol g}^{-1}$, respectively. To summarize, the adsorption activity of aniline and 1-naphthol were optimum in order of Z-CTAB > ZAA > ZA and adsorption capacity of Z-CTAB for 1-naphthol > adsorption capacity of Z-CTAB for aniline.

Keywords: adsorption, aniline, 1-naphthol, zeolite.