

**ASAM HUMAT DAN ASAM FULVAT TERMODIFIKASI MAGNETIT
MENGGUNAKAN METODE KOPRESIPITASI SEBAGAI ADSORBEN
Cr(VI) PADA LIMBAH INDUSTRI BATIK**

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INTISARI

Modifikasi asam humat dan asam fulvat dengan magnetit menggunakan metode kopresipitasi sebagai adsorben Cr(VI) pada limbah industri batik telah dilakukan. Tujuan dilakukan penelitian ini adalah untuk mensintesis magnetit terlapis asam humat dan magnetit terlapis asam fulvat dari sampel tanah gambut Riau. Selain itu pengaruh pH dan waktu kontak larutan Cr(VI) terhadap kemampuan adsorpsi pada asam humat termodifikasi magnetit serta asam fulvat termodifikasi magnetit dipelajari, serta mempelajari kapasitas adsorpsi antara asam humat termodifikasi magnetit dan asam fulvat termodifikasi magnetit dalam menurunkan kadar larutan Cr(VI).

Penelitian diawali dengan ekstraksi asam humat dan asam fulvat dari tanah gambut yang sama, dilanjutkan dengan melakukan sintesis $\text{Fe}_3\text{O}_4\text{-AH}$ dan $\text{Fe}_3\text{O}_4\text{-AF}$ secara kopresipitasi menggunakan agen pengendap NH_4OH pada campuran garam $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$, AH dan AF hasil ekstraksi. $\text{Fe}_3\text{O}_4\text{-AH}$ dan $\text{Fe}_3\text{O}_4\text{-AF}$ dikarakterisasi dengan spektroskopi FTIR, XRD, kemudian dilakukan penentuan pH *point of zero charge* (pH_{pzc}), kestabilan magnetit, keasaman total, kandungan $-\text{COOH}$, kandungan $-\text{OH}$ dan diaplikasikan untuk adsorpsi ion logam Cr(VI) pada limbah batik industri. Pengaruh pH adsorpsi dan kinetika adsorpsi juga telah dipelajari.

Dari hasil isolasi di peroleh padatan asam humat berwarna hitam kecoklatan dan asam fulvat berwarna kuning. Selanjutnya dilakukan uji karakterisasi menggunakan FTIR dan XRD, terlihat bahwa pelapisan Fe_3O_4 oleh asam humat dan asam fulvat telah berhasil dilakukan, yaitu dengan terdeteksinya perbedaan puncak serapan $\text{Fe}_3\text{O}_4\text{-AH}$ dan $\text{Fe}_3\text{O}_4\text{-AF}$ pada spektra FTIR serta penurunan intensitas pada difraktogram XRD. Proses adsorpsi pada $\text{Fe}_3\text{O}_4\text{-AH}$ maupun $\text{Fe}_3\text{O}_4\text{-AF}$ mengikuti model kinetika pseudo orde dua H_0 , dengan laju adsorpsi masing-masing sebesar $197,601 \text{ mg g}^{-1} \text{ menit}^{-1}$ dan $190,830 \text{ mg g}^{-1} \text{ menit}^{-1}$. Konsentrasi adsorbat teradsorpsi yang diperoleh dengan menggunakan adsorben $\text{Fe}_3\text{O}_4\text{-AH}$ dan $\text{Fe}_3\text{O}_4\text{-AF}$ masing-masing yaitu $0,001 \text{ mg/g}$ dan $0,052 \text{ mg/g}$.

kata kunci: adsorpsi, asam humat, difraktogram, kopresipitasi, magnetit.

HUMIC ACID AND FULVIC ACID MODIFIED MAGNETITE USING COPRECIPITATION METHOD AS ADSORBENT OF Cr(VI) FROM WASTE BATIK INDUSTRY

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ABSTRACT

Modification of humic acid and fulvic acid with magnetite using coprecipitation method as adsorbent of Cr(VI) from waste batik industry had been conducted. The purpose of this study was to synthesize humic acid-coated magnetite and fulvic acid-coated magnetite from Riau peat soil samples. In addition study the effect of pH and contact time of Cr(VI) solution on the adsorption ability of magnetite-modified humic acid and magnetite-modified fulvic acid, and studied the adsorption capacity of magnetite-modified humic acid and magnetite-modified fulvic acid in reducing the concentration of Cr(VI) solution.

This research was initiated with extraction of humic acid and fulvic acid from the same peat soil, followed by the synthesis of Fe₃O₄-AH and Fe₃O₄-AF by coprecipitation using the precipitating agent NH₄OH in a mixture of FeSO₄·7H₂O, FeCl₃·6H₂O, AH and AF from extracted. Fe₃O₄-AH and Fe₃O₄-AF were characterized by FTIR spectroscopy, XRD, then determined pH point of zero charge (pH_{PZC}), magnetite stability, total acidity, -COOH content, -OH content and applied for the adsorption of Cr(VI) metal ions on industrial batik waste. The effect of adsorption pH and adsorption kinetics has also been studied.

From the isolation results, the humic acid solids were brownish black and fulvic acid was yellow. Furthermore, characterization tests were carried out using FTIR and XRD, it appears that the coating of Fe₃O₄ by humic acid and fulvic acid has been successfully carried out, namely by detecting differences in the absorption peaks of Fe₃O₄-AH and Fe₃O₄-AF in the FTIR spectra and decreasing the intensity on the XRD diffractogram when the results of the characterization are compared. The adsorption process on Fe₃O₄-AH and Fe₃O₄-AF followed the pseudo second order kinetic model Ho, with adsorption rates of 197.601 mg g⁻¹ min⁻¹ and 190.830 mg g⁻¹ min⁻¹ respectively. The adsorbate concentrations obtained using Fe₃O₄-AH and Fe₃O₄-AF adsorbents were 0.001 mg/g and 0.052 mg/g.

keywords: adsorption, humic acid, diffractogram, coprecipitation, magnetite