

## **ASAM HUMAT TINJA KUDA SEBAGAI *GREEN* ADSORBEN PADA ADSORPSI LOGAM Pb(II) DAN Ni(II)**

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### **INTISARI**

Telah diteliti bahwa tinja kuda dapat dijadikan sumber asam humat yang lebih *green*, asam humat hasil ekstraksi selanjutnya digunakan sebagai adsorben logam berat Pb(II) dan Ni(II). Ekstraksi asam humat dari tinja kuda dilakukan sesuai prosedur IHSS (*International Humic Substance Society*) di bawah atmosfer udara. Berdasarkan perlakuan ekstraksi, diperoleh 4 jenis asam humat tinja kuda. Keempat jenis asam humat tinja kuda tersebut diuji kemampuan adsorpsinya terhadap logam Pb(II) dan Ni(II). Asam humat tinja kuda murni (AHTK murni) dengan kandungan keasaman total paling tinggi menunjukkan kemampuan adsorpsi paling baik.

Persentase ekstraksi asam humat murni dari tinja kuda mencapai sekitar 0,40%. Aspek adsorpsi yang dipelajari meliputi pengaruh pH, waktu kontak, kinetika, kapasitas, energi adsorpsi, serta adsorpsi kompetitif logam Pb(II) dan Ni(II) pada AHTK murni. Pada rentang pH di bawah titik muatan netral masing-masing logam, kenaikan pH menyebabkan kenaikan persentase adsorpsi, dimana pH optimum adsorpsi Pb(II) adalah 5, dan Ni(II) pada pH 7. Tetapan laju adsorpsi Ni(II) yang lebih cepat, yaitu 0,071 g/mg menit, dibandingkan Pb(II), yaitu 0,024 g/mg menit, menyebabkan waktu optimum adsorpsi Ni(II) lebih cepat tercapai. Adsorpsi Pb(II) dan Ni(II) pada AHTK murni mengikuti model isoterm adsorpsi Langmuir dengan kapasitas adsorpsi Pb(II) dan Ni(II) berturut-turut sebesar 100 mg/g dan 27,78 mg/g, dan besarnya energi adsorpsi dari kedua logam menunjukkan terjadinya proses kemisorpsi. Logam Pb(II) cenderung memenangkan adsorpsi kompetitif terhadap Ni(II) karena memiliki ukuran ion hidrat lebih kecil dan laju difusi yang lebih cepat di permukaan asam humat.

Kata kunci : asam humat, tinja kuda, adsorpsi kompetitif, Pb(II), Ni(II).

## **HORSE FECES HUMIC ACID AS A GREEN ADSORBENT ON THE ADSORPTION OF Pb(II) AND Ni(II)**

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### **ABSTRACT**

Horse feces had been confirmed as a green source of humic acid, the extracted humic acid was then used as an adsorbent for Pb(II) and Ni(II) adsorption. Extraction of humic acid from horse feces was done according to IHSS (International Humic Substance Society) procedure in O<sub>2</sub> atmosphere. Based on the extraction treatment, there were 4 types of extracted horse feces humic acid. Adsorption ability of that 4 extracted humic acid types was tested. Pure horse feces humic acid (pure HFHA) that has the highest content of total acidity, showed the most excellent adsorption ability.

The amount percentage of pure horse feces humic acid was about 0.40%. The study of adsorption aspects were effect of pH, contact time, kinetics, capacity, adsorption energy, and competitive adsorption of Pb(II) and Ni(II) in pure HFHA. In the pH range lower than the neutral charge point of each metal, increasing pH caused percentage of adsorption increased, the optimum pH of Pb(II) adsorption was 5, and Ni(II) was 7. The adsorption rate constant of Ni(II), that was 0.071 g/mg minute, was faster than Pb(II), that was 0.024 g/mg minute, indicated that the optimum contact time of Ni(II) adsorption was faster than Pb(II). Adsorption of Pb(II) and Ni (II) in pure HFHA followed Langmuir adsorption isotherm, with adsorption capacity of Pb(II) was 100 mg/g and Ni(II) was 27.78 mg/g, and the amount of adsorption energy of both metals showed the chemisorption process. Pb (II) tend to win the competitive adsorption to Ni(II) because Pb(II) has smaller size of ion hydrate, it caused the rate of Pb(II) diffusion in the surface of humic acid faster than Ni(II).

Key words : humic acid, horse feces, competitive adsorption, Pb(II), Ni(II).