RINGKASAN

Lempung alam Desa Cengar telah dimodifikasi untuk memperbaiki sifat adsorpsinya. Tiga pemodifikasi dipilih yakni larutan berair 1 molar ammonium asetat, ammonium klorida dan sodium klorida. Semua lempung dikarakterisasi jenis dan identitas mineral, komposisi, jumlah kation penukar dan morfologi permukaan. Logam Cu dan Ni dipilih sebagai model adsorpsi pada setiap adsorben dengan mengatur waktu kontak, konsentrasi adsorbat, temperatur proses dan pH larutan adsorbat. Data-data adsorpsi diolah menurut konsep kinetika, kesetimbangan dan termodinamika.

Mineral-mineral penyusun lempung alam adalah kaolinit, muscovit dan kuarsa. Tidak ada perubahan jenis mineral, komposisi oksida logam dan morfologi permukaan, tetapi intensitas mineral, jumlah oksida logam dan kation penukar berubah setelah modifikasi. Studi adsorpsi Cu dan Ni oleh lempung alam dan lempung modifikasi menunjukkan adsorpsi mengikuti kinetika order pseudo-kedua (k_2 = 0,74 -5,74 g mg^{-1} min^{-1} untuk Cu dan 1,0-19,23 g mg^{-1} min^{-1} for Ni), isoterm Langmuir dengan kapasitas monolayer 0,25 – 0,63 mg g^{-1} untuk Cu dan 0,35 – 0,56 mg g^{-1} untuk Ni. Secara termodinamika, proses adsorpsi eksotermis (- ΔH = 9,6 – 93,3 $kJmol^{-1}$ untuk Cu dan10,7 – 168,9 $kJmol^{-1}$ untuk Ni), dengan penurunan entropi dan kenaikan energy bebas Gibbs. Adsorpsi bekerja pada pH 3,5 – 6,7 (Cu) dan 5-7,4 (Ni). Sodium asetat merupakan pemodifikasi terbaik, diikuti oleh ammonium asetat untuk adsorpsi Cu dan sodium asetat untuk adsorpsi Ni.

SUMMARY

Natural clay of Desa Cengar was modified to improve its adsorption behavior. Three of selected modifiers were 1 molar aqueous of ammonium acetic, ammonium chloride and sodium acetic, respectively. Type and identity of mineral, composition of metal oxides, exchangeable cation capacity and morphology of surface were characterized. Cu and Ni were taken as adsorption model on the adsorbents with contact time, concentration of adsorbate, temperature of process and pH of adsorbate solution were varied. Kinetic, equilibrium and thermodynamic of adsorption were studied on the data of adsorption.

The natural clay consist of kaolinite, muscovite and quartz. No change of the mineral type, composition of metal oxides and morphology of surface, however, mineral intensity, number of metal oxides and exchangeable cation capacity are change after modification. Study of adsorption of Cu and Ni on natural and modified clay were showed that kinetic of the interactions could be represented by a mechanism based on pseudo-second order kinetics (k_2 = 0.74 to 5.74 g mg^{-1} min^{-1} for Cu and 1.0 to 19.23 g mg^{-1} min^{-1} for Ni) . The adsorption followed Langmuir isotherm model with monolayer adsorption capacity of 0.25 to 0.63 mg g^{-1} for Cu and 0.35 to 0.56 mg g^{-1} for Ni. The process was exothermic (- ΔH = 9.6 to 93.3 $kJmol^{-1}$ for Cu and 10.7 to 168.9 $kJmol^{-1}$ for Ni) accompanied by decrease in entropy and increase in Gibbs energy. Adsorption of metals on the clays are influenced by pH of adsorbate solution with pH of 3.5 to 6.7 for Cu and 5 to 7.4 for Ni. By the results, sodium acetic is the best modifier, followed by ammonium acetic is the second with respect to Cu, and sodium acetic for Ni, respectively.