Utilization of zeolites synthesized from water sludge for heavy metal treatment in wastewater

Issaraporn Saenglaml, Uthai Donkwang, Kotchakorn Yotyiamkrae, Warangkana Kittiwongwisan, Bongkotchawan Pakamwong, Nittaya Phankon, Orawan Simpan, Malinee Rangkatkij, Suphawan Pimdee, Thimpika Promprom, Malee Prajuabsuk, Saisamon Lamlong, Janpen Intaraprasert, Daungdao Sattayakul, Pharit Kamsri, Parjaree Thavorniti, Pornpan Pungpo

1Department of Chemistry, Faculty of Science, Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand
2Division of Chemistry, Faculty of Science, Nakhon Phanom University, Nakhon Phanom 48000, Thailand
3National Metal and Materials Technology Center (MTEC), NSTDA, 111 Thailand Science Park, Klong Luang, Pathum Thani Thailand

*E-mail: pornpan_ubu@yahoo.com

Abstract: Metal contamination is a major problem in industrial wastewater. Because it non-biodegradability and toxic. The adsorbent popularly used for heavy metal adsorption of wastewater is activated carbon because of its high surface area, resulting in high efficiency in wastewater treatment. But activated charcoal is relatively expensive, so the synthetic zeolites have been considered as heavy metal adsorbent. This work, water sludge was used as raw material to synthesize zeolite using alkali fusion method. The structural characterization of the zeolite was performed using XRD, SEM and FTIR. The adsorption efficiency to removal Cd (II) with different adsorption parameters were investigated. The optimum parameters for adsorbent of the removal of Cd (II) ions at 50 mg/L initial Cd (II) ions in aqueous solution concentration were elucidated. The optimum dosage of adsorbent is 4 g/L and optimum adsorption time is 30 minutes with 98% of Cd (II) ions in aqueous solution. The adsorption isotherm and adsorption kinetic are corresponded well to Langmuir adsorption and pseudo second order kinetic model, respectively. Based on the obtained results, the synthesized zeolite is a highly efficient adsorbent for the removal of Cd (II) ions in aqueous solution.

Keywords: Zeolite from sludge; Adsorbent; Removal of Cd (II)