

Development of Natural Zeolites Adsorbent: Preliminary Study on Water-Isopropyl Alcohol Adsorption in a Close-Loop Continuous Adsorber

Authors : Sang Kompiang Wirawan, Pandu Prabowo Jati, I Wayan Warmada

Abstract : Klaten Indonesian natural zeolite can be used as powder or pellet adsorbent. Pellet adsorbent has been made from activated natural zeolite powder by a conventional pressing method. Starch and formaldehyde were added as binder to strengthen the construction of zeolite pellet. To increase the absorptivity and its capacity, natural zeolite was activated first chemically and thermally. This research examined adsorption process of water from Isopropyl Alcohol (IPA)-water system using zeolite adsorbent pellet from natural zeolite powder which has been activated with H₂SO₄ 0.1 M and 0.3 M. Adsorbent was pelleted by pressing apparatus at certain pressure to make specification in 1.96 cm diameter, 0.68 cm thickness which the natural zeolite powder (-80 mesh). The system of isopropyl-alcohol water contained 80% isopropyl-alcohol. Adsorption process was held in close-loop continuous apparatus which the zeolite pellet was put inside a column and the solution of IPA-water was circulated at certain flow. Concentration changing was examined thoroughly at a certain time. This adsorption process included mass transfer from bulk liquid into film layer and from film layer into the solid particle. Analysis of rate constant was using first order isotherm model that simulated with MATLAB. Besides using first order isotherm, intra-particle diffusion model was proposed by using pore diffusion model. The study shows that adsorbent activated by H₂SO₄ 0.1 M has good absorptivity with mass transfer constant at 0.1286 min⁻¹.

Keywords : intra-particle diffusion, fractional attainment, first order isotherm, zeolite

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