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ABSTRACT

The objective of this work is modeling and experimental studies on the thermal regeneration of the 3A and 4A zeolite molecular sieves used for dewatering of liquid aliphatic alcohols: ethanol, propanol and butanol in temperature swing adsorption (TSA) process. Tests were carried out on a zeolite adsorbent fixed bed of 1270 g (3A) or 1130 g (4A) weight, 76 cm height and 5 cm diameter. Liquid saturated bed was regenerated in two main steps: drying and desorption. In the drying step unbound mixture of alcohol and water evaporates from the surface of zeolite adsorbent bed. In the desorption step water bound by adsorption forces is removed. The both process steps can be partially overlapped in successive layers of the bed. The influence of the inlet hot air temperature T_0 (200-250ºC), water mass fraction x_W in dewatered alcohol solution (0.021-0.176 kg/kg), and air mass flux density N_{air} (0.170-0.306 kg/m^{2}s) on regeneration efficiency of the zeolite adsorbent bed was studied. From this analysis it follows that: $T_{0,}$ x_W and N_{air} exert measurable influence (in the order of impact). The desorption process is described by the adequate mathematical model, including heat transfer between zeolite particles and hot air