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MATHEMATICAL MODELING OF GAS DRYING BY ADSORPTION

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Abstract

Theoretical and experimental studies of gas drying processes by adsorption in fixed bed of grains are presented in this paper. Based on an extensive literature study, some of the most representative mathematical models describing gas adsorption in fixed bed and consequently gas drying processes by adsorption in fixed bed are also presented. Using a mathematical model from those mentioned describing adsorption under isotherm regime, the temperature and gas flow velocity effects over the distribution of adsorbate concentration in solid phase as a function of time and throughout the height of fixed adsorbent bed are studied. The air-drying process by dynamic adsorption in fixed bed of silica gel was considered at four values of temperature (20, 27, 38, 49°C) and various values of air velocity ranged between 0.1 and 1.0 m/s. The packed bed height varied between 0 to 1 m and the adsorption time ranged between 300 to 10^5 s. Since the considered mathematical model assumes a known value of mass transfer coefficient, this was determined experimentally by using an experimental setup at the same values of temperature (20, 27, 38, 49°C) and air flow rates ranging between 4 and 20 m^3/h.

Key words: mass transfer, mathematical modeling, gas drying, adsorption, silica gel

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