

Investigating the effect of ZnO adsorbent properties on the natural gas desulfurization process to evaluate the performance of the adsorbents

Sulfur is a toxic agent to most catalysts of the unit. Therefore, to eliminate the sulfur, the processes of hydrogenation and desulfurization should be performed on the feed gas. In this research, the natural gas desulfurization process by zinc oxide adsorbent was modeled by using the grain model. To analyze the adsorbent properties, two commercial samples were tested by BET, XRF, SEM, and mercury porosimetry. The results showed that the model with an error of less than 2% corresponds to experimental data. The obtained results from sensitivity analysis indicated that the pellet porosity has the highest breakthrough time within 0.4-0.55. It was also found that by increasing the bulk density, breakthrough time increases, but also it increases the pressure drop of the bed. Comparing the breakthrough time and conversion of commercial adsorbent samples, it was observed that Topsoe commercial adsorbent (1) had a better performance than Sud-Chemie commercial adsorbent for specific operational conditions. The breakthrough time and the conversion of commercial adsorbent 1 have been calculated at 215 days and 90%, respectively, and for commercial adsorption 2, 185 days and 87% respectively.