

Adsorption of carbon dioxide using activated carbon impregnated with Cu promoted by zinc

ABSTRACT

In the present study, modified activated carbon (AC) was used in a fixed-bed column for CO₂ adsorption of gaseous mixtures. The adsorbents were prepared by impregnation two metals Cu and Zn on the surface of the acid modified AC using a two-stage modification. At the first stage, the samples of AC were pretreated by oxidizing agent (nitric acid) to increase the amount of oxygen surface groups and at the second stage, the acid modified AC were impregnated by two metal salts Cu and Zn on the surface to produce a superior CO₂ adsorbent. Metal-loaded acid modified AC was prepared by using different ratios of Cu/Zn ranging from 4 to 20%. The CO₂ adsorbed have been measured over the temperature range of (30–50 °C), pressure (100–200 kPa) and CO₂ concentrations from 5 to 50%. An increase of 49% CO₂ adsorbed was resulted by using modified activated carbon. The breakthrough curves indicated that the breakthrough time increased with increasing the operating pressure, and decreased with increasing the temperature from 30 to 50 °C and CO₂ concentration from 5 to 50%. The deactivation model was successfully applied to analyze the breakthrough curves under various operating conditions

Keywords: CO₂ adsorption; Modified activated carbon; Metal impregnation (Cu/Zn); Deactivation model