

CO₂ Capture by Clay and Its Adsorption Mechanism

Authors : Jedli Hedi, Hedfi Hachem, Abdessalem Jbara, Slimi Khalifa

Abstract : Natural and modified clay were used as an adsorbent for CO₂ capture. Sample of clay was subjected to acid treatments to improve their textural properties, namely, its surface area and pore volume. The modifications were carried out by heating the clays at 120 °C and then by acid treatment with 3M sulphuric acid solution at boiling temperature for 10 h. The CO₂ adsorption capacities of the acid-treated clay were performed out in a batch reactor. It was found that the clay sample treated with 3M H₂SO₄ exhibited the highest Brunauer–Emmett–Teller (BET) surface area (16.29–24.68 m²/g) and pore volume (0.056–0.064 cm³/g). After the acid treatment, the CO₂ adsorption capacity of clay increased. The CO₂ adsorption capacity of clay increased after the acid treatment. The CO₂ adsorption by clay, were characterized by SEM, FTIR, ATD-ATG and BET method. For describing the phenomenon of CO₂ adsorption for these materials, the adsorption isotherms were modeled using the Freundlich and Langmuir models. CO₂ adsorption isotherm was found attributable to physical adsorption.

Keywords : clay, acid treatment, CO₂ capture, adsorption mechanism

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