

Co2 capture using graphite waste composites and ceria

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Abstrak

Solid sorbents based on graphite electrode waste and cerium oxide (ceria, CeO₂) have been studied with regard to CO₂ capture. The acid-base properties of cerium oxide produce a sorbent for the capture of CO₂. The aim of the study is to evaluate the performance of CO₂ capture using graphite/CeO₂ composites at different weights of Ce(NO₃)₃·6H₂O (0.5, 1 and 2 g), namely G0.5, G1 and G2, respectively. Volumetric adsorption studies of CO₂ on graphite/CeO₂ composites and ceria were conducted at various pressures (P) of 3, 5, 8, 15 and 20 bar, and temperatures (T) of 303, 308, 318 K. Graphite waste before modification (GBM), activated graphite waste (GA), and CeO₂ for capturing CO₂ were also investigated. By varying the two parameters (P and T), we found that the maximum adsorption capacities of CO₂ at 303 K and 20 bar were 0.0713, 0.0316, 0.1574, 0.0987, 0.1137, and 0.0964 kg/kg respectively, for GBM, GA, G0.5, G1, G2 and CeO₂. The highest adsorption capacity of CO₂ was found in the G0.5 composite. The adsorption performance of CO₂ using ceria was almost similar to the G1 composite. We found that CO₂ adsorption capacity decreases with an increasing temperature from 303 to 318 K. It was concluded that ceria and composite graphite waste/CeO₂ are stable and selective CO₂ sorbents. The work allows us to synthesize a new sorbent which can be effectively applied for CO₂ capture. The adsorption capacity of CO₂ depends significantly on the active site and chemical modifier of the sorbents.