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.