

## Co<sub>2</sub> capture using graphite waste composites and ceria

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### Abstrak

Solid sorbents based on graphite electrode waste and cerium oxide (ceria, CeO<sub>2</sub>) have been studied with regard to CO<sub>2</sub> capture. The acid-base properties of cerium oxide produce a sorbent for the capture of CO<sub>2</sub>. The aim of the study is to evaluate the performance of CO<sub>2</sub> capture using graphite/CeO<sub>2</sub> composites at different weights of Ce(NO<sub>3</sub>)<sub>3</sub>·6H<sub>2</sub>O (0.5, 1 and 2 g), namely G0.5, G1 and G2, respectively. Volumetric adsorption studies of CO<sub>2</sub> on graphite/CeO<sub>2</sub> 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 CeO<sub>2</sub> for capturing CO<sub>2</sub> were also investigated. By varying the two parameters (P and T), we found that the maximum adsorption capacities of CO<sub>2</sub> 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 CeO<sub>2</sub>. The highest adsorption capacity of CO<sub>2</sub> was found in the G0.5 composite. The adsorption performance of CO<sub>2</sub> using ceria was almost similar to the G1 composite. We found that CO<sub>2</sub> adsorption capacity decreases with an increasing temperature from 303 to 318 K. It was concluded that ceria and composite graphite waste/CeO<sub>2</sub> are stable and selective CO<sub>2</sub> sorbents. The work allows us to synthesize a new sorbent which can be effectively applied for CO<sub>2</sub> capture. The adsorption capacity of CO<sub>2</sub> depends significantly on the active site and chemical modifier of the sorbents.