

## **Improvement of carbon dioxide capture using graphite waste/ $\text{Fe}_3\text{O}_4$ composites**

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### **Abstrak**

The abundance of graphite waste can be processed into valuable materials; one alternative is by making it into an adsorbent. Graphite-based adsorbent modification can be accomplished by adding magnetite nanoparticles  $\text{Fe}_3\text{O}_4$ . The addition of magnetite nanoparticles has been reported to improve the adsorption ability of the graphite waste. In this study, we have developed a new carbon dioxide ( $\text{CO}_2$ ) adsorbent based on graphite waste modified with magnetite nanoparticle  $\text{Fe}_3\text{O}_4$ . The  $\text{Fe}_3\text{O}_4$  were prepared using an impregnation technique. The graphite/ $\text{Fe}_3\text{O}_4$  composites were characterized by scanning electron microscopy with an energy-dispersive X-ray system (SEM-EDX) and Brunauer, Emmett, and Teller (BET). The  $\text{CO}_2$  adsorption performance was evaluated using an isothermal adsorption method at various temperatures (30, 35, and 45°C) and pressures (3, 5, 8, 15, and 20 bar). This resulted in graphite with different magnetite modification levels, namely non-modified graphite (GNM), a graphite/ $\text{Fe}_3\text{O}_4$  20% (w/w) composite (G/ $\text{Fe}_3\text{O}_4$  20%), and a graphite/ $\text{Fe}_3\text{O}_4$  35% (w/w) (G/ $\text{Fe}_3\text{O}_4$  35%), which indicated that the largest adsorption capacity is 10.305 mmol.g<sup>-1</sup> at 30°C and 20 bar pressure for the G/ $\text{Fe}_3\text{O}_4$  20% composite. This finding further revealed that modifying graphite waste with magnetite nanoparticles  $\text{Fe}_3\text{O}_4$  has been proved to increase the capacity for adsorbing  $\text{CO}_2$  gas.