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Improvement of carbon dioxide capture using graphite waste/ fe3o4 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 Fe3O4. 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 (CO2) adsorbent based on graphite waste modified with magnetite nanoparticle Fe3O4. The Fe3O4 were prepared using an impregnation technique. The graphite/Fe3O4 composites were characterized by scanning electron microscopy with an energy-dispersive X-ray system (SEM-EDX) and Brunauer, Emmett, and Teller (BET). The CO2 adsorption performance was evaluated using an isothermal adsorption method at various temperatures (30, 35, and 45oC) 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/Fe3O4 20% (w/w) composite (G/Fe3O4 20%), and a graphite/Fe3O4 35% (w/w) (G/Fe3O4 35%), which indicated that the largest adsorption capacity is 10.305 mmol.g-1 at 30oC and 20 bar pressure for the G/Fe3O4 20% composite. This finding further revealed that modifying graphite waste with magnetite nanoparticles Fe3O4 has been proved to increase the capacity for adsorbing CO2 gas.