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Graft copolymer templated synthesis of mesoporous MgO/TiO_2 mixed oxide nanoparticles and their CO_2 adsorption capacities

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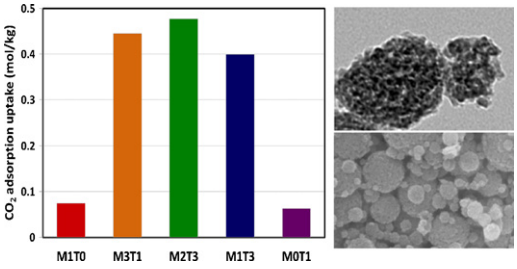
HIGHLIGHTS

- Mesoporous MgO/TiO_2 mixed oxides were synthesized via a sol–gel process.
- PVC-*g*-POEM graft copolymer was templated.
- MgO/TiO_2 mixed oxide exhibited much higher CO_2 adsorption capacity than pure MgO or TiO_2.

GRAPHICAL ABSTRACT

Mesoporous MgO/TiO_2 mixed oxides were synthesized via a sol–gel process by templating poly(vinyl chloride)-*g*-poly(oxyethylene methacrylate) (PVC-*g*-POEM) graft copolymer. MgO/TiO_2 mixed oxide exhibited much higher CO_2 adsorption capacity than pure MgO or TiO_2 due to the increased surface area and pore volume.



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ABSTRACT

Mesoporous mixed oxide nanoparticles consisting of MgO and TiO_2 were synthesized via a sol–gel process by templating poly(vinyl chloride)-*g*-poly(oxyethylene methacrylate) (PVC-*g*-POEM) graft copolymer. The mesoporous structures and morphologies of the MgO/TiO_2 mixed oxides were characterized using X-ray diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM) and nitrogen adsorption/desorption analysis. Interestingly, MgO/TiO_2 mixed oxide exhibited much higher CO_2 adsorption capacity (0.477 mol CO_2/kg sorbent for 40:60 MgO/TiO_2) than pure MgO (0.074) or TiO_2 (0.063). This result arises from the increase in surface area and pore volume of the mixed oxide due to the formation of bimodal pores.

1. Introduction

As carbon dioxide emissions resulting from the use of fossil fuels has been regarded as a main cause for global warming, considerable interest has been generated for carbon dioxide capture and storage (CCS) as a feasible solution to reduce the concentration of atmospheric carbon dioxide [1–3]. Absorption by aqueous solutions or

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