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CO2 CAPTURE USING NANOPOROUS TIO(OH)2/TETRAETHYLPENTAMINE

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In this work, an inorganic-organic CO2 sorbent was prepared by immobilizing tetraethylenepentamine (TEPA) onto nanoporous titanium oxyhydrate (TiO(OH)2). The prepared sorbents were characterized using X-ray diffraction, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), thermogravimetric analysis (TGA), and Brunauer-Emmett-Teller (BET) analysis. At the optimal TEPA loading of 60 wt.% on TiO(OH)2, its CO2 sorption capacity reached 3.1 mmol CO2/g-sorbent for 1 vol.% CO2 in N2 along with ~1 vol.% H2O at 60°C. Studies of adsorption kinetics and thermodynamics showed that the activation energies for CO2 adsorption and desorption of TiO(OH)2/TEPA are 38.31 kJ/mol and 44.51 kJ/mol, respectively. Its low CO2 desorption activation energy means a high CO2 dsorption rate and thus a low CO2 capture cost. The sorbent has the potential to be used for capturing ultra-dilute CO2 from gas mixtures.
Key words: CO2 capture; nanoporous titanium oxyhydrate; sorption; kinetics

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