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Amide-based imprinted polymers as potential adsorbents for CO₂ capture [Abstract]

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Amide-based Imprinted Polymers as Potential Adsorbents for CO₂ Capture

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Amide-based molecularly imprinted polymer (MIP) adsorbents for post combustion CO₂ capture were synthesized by the simple bulk polymerization method using methacrylamide as the functional monomer and oxalic acid as the template. Polymerisation was carried out at 60 °C for 3h using EGDMA, AIBN, and 80/20 (v/v) mixture of acetonitrile and DMF as cross linker, initiator and solvent blend, respectively. The synthesized polymers were ground and screened to 50-212 µm and template was then extracted from the polymerized MIPs with methanol:HCl (9:1 v/v). The dynamic CO₂ adsorption capacities were investigated in a fixed bed adsorption column. The FTIR and XPS spectra revealed a large number of -NH₂ functionality distributed on the MIPs surface, enhancing the CO₂ uptake capacity. The MIP with the highest concentration of template possessed the highest CO₂ capture capacity (0.40 mmol/g at 313 K and 0.15 bar partial pressure, SBET 258 m²/g), while the non-imprinted counterpart exhibited the lowest (0.34 mmol/g at 313 K and 0.15 bar partial pressure, SBET 250 m²/g). The MIPs were thermally stable up to 245 °C and the isotherms of all the MIPs exhibited a typical shape of type II featuring a non-uniform distribution of pore size.

Keywords: CO₂ capture capacity, Template, Amide-functionality, Methacrylamide

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