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PARAMETRIC INVESTIGATION OF CO₂-MIPS PRODUCTION USING SUSPENSION POLYMERISATION METHOD

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Keywords: Molecularly imprinting polymers, Suspension polymerizations, CO₂ sorbents, post-combustion carbon capture.

Abstract: Synthesis of a promising capture material based on CO₂ molecularly imprinting polymers, CO₂-MIPs, using suspension polymerization method has been studied. Molecular imprinting technique is used to create polymers with molecular recognition properties based on a specific molecule. Therefore, the synthetic polymers have a high selectivity to the target molecule. The inherent hydrophobic properties of CO₂-MIPs make them an ideal capture material to remove CO₂ from flue gases containing steam, which is a challenge in well-known CO₂ sorbents, such as metal organic frameworks (MOF). In addition, CO₂-MIPs developed in this study adsorb CO₂ molecules through a non-covalent interaction. The non-covalent bonds are weak and can be readily broken when heated. Therefore, the required energy for separation of CO₂ molecules adsorbed on the surface of CO₂-MIPs is considerably low.

Previously, bulk polymerization was used to produce CO₂-MIPs (Zhao et al., 2014). Although, a relative good CO₂ capturing capacity and high stable capture efficiency in repetitive cycles achieved, the process consists of grinding and sieving of produced polymers, which is time consuming, laborious, and just 30-40% of polymers with non-uniform size and irregular shape could be recovered.

In this study, suspension polymerization method was used where acrylamide, EDGMA, ethanedioic acid AIBN are used as a functional monomer, cross-linker, dummy template and initiator respectively. Uniform and spherical shape of CO₂-MIPs produced with this method, dramatically increase the surface area and consequently loading capacity. In addition, the impact of agitation speed, concentration of stabilizer, and progen types on particle morphology and capture efficiency has been systematically investigated. CO₂-MIPs with size over the range of 5-200 μm were produced, which based on their size can be used in domestic and industrial applications such as CO₂ filters or CO₂ capture material in post-combustion carbon capture.

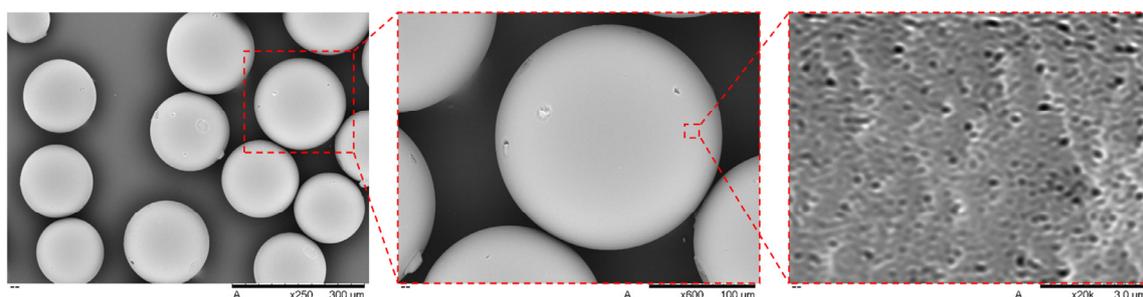


Figure 1. Produced CO₂-MIPs using suspension polymerisation method.

References: Zhao, Y., Shen, Y., Ma, G., Hao, R.; Adsorption Separation of Carbon Dioxide from Flue Gas by a Molecularly Imprinted Adsorbent, *Environ. Sci. Technol.*, 48, 1601–1608, 2014.

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