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Synthesis of CO₂ capture materials via innovative emulsification routes

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1. Concept

Double emulsion: encapsulated CO₂ solvent

2. Particle synthesis

Membrane emulsification

Suspension polymerisation

Template (Oxalic acid)

Monomer (Acrylamide)

Polymerisation with cross-linker (EGDMA)

Template removal

CO₂ capture

CO₂ release (heating process)

3. CO₂ capture test

Thermal stability analysis

CO₂ adsorption isotherms

Experimental apparatus for fixed-bed adsorption

Conclusions

• Development of an axisymmetric VOF-CSF model. The model was capable of reproducing droplet formation in dripping, narrowing and widening jetting regimes, as well as complex phenomena such as satellite and multi-cored droplet formation.

• The model was not able to prevent the droplet coalescence in the collection tube since the kinetics of adsorption of surfactants at fluid–fluid interfaces was not taken into account, which should be further investigated.

• Successfully production of encapsulated CO₂ solvent within a three phase glass capillary microfluidic device via on-the-fly photo-induced polymerisation approach in less than 3 minutes.

• Successfully production and characterisation of a highly selective CO₂ sorbent based on molecularly imprinting technology and oxalic acid template using a combination of membrane emulsification and suspension polymerisation approach.

References

