

Polymer Synthesis and Processing using Supercritical Fluids

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Supercritical carbon dioxide has attracted much interest recently as an alternative solvent for the synthesis and processing of advanced materials. In Liverpool, we are developing new methods for the preparation of advanced organic and inorganic materials using compressed fluid solvents. This lecture will summarize work in the following areas:

(i) Synthesis of polymer microspheres by dispersion polymerization using compressed fluid solvents

- Techniques for synthesizing linear and cross-linked polymer microspheres by dispersion polymerization
- Development of alternative hydrofluorocarbon (HFC) solvents (*e.g.*, R134a) that can be used at much lower pressures than scCO_2
- High-throughput discovery of HFC-soluble hydrocarbon polymers
- Development of inexpensive hydrocarbon stabilizers for use in HFC solvents

(ii) Synthesis of porous polymer monoliths and beads using scCO_2 as a 'pressure-adjustable' porogen

- 'Solvent-free' synthesis of porous materials using scCO_2 as a porogen
- Fine-control over pore structure by varying CO_2 -density
- *In situ* synthesis of porous column packings

(iii) Synthesis of emulsion-templated polymers and inorganic materials

- Synthesis of porous materials by polymerization of concentrated C/W emulsions
- Synthesis of emulsion templated polymer beads by O/W/O sedimentation polymerization

(iv) Compressed fluid sedimentation polymerization

- A new semi-continuous method for the preparation of large polymer beads

References

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