POLYMERISATION USING SUPERCRITICAL FLUIDS: GREEN ROUTES TO SMART MATERIALS

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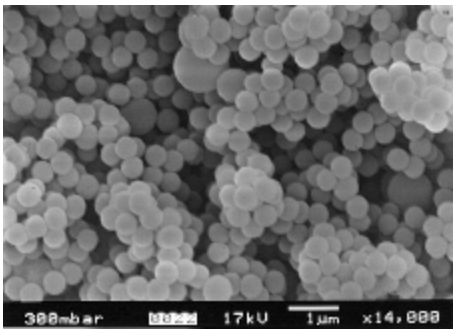
Synthetic polymers have found an enormous number of uses in modern society, ranging from low-tech applications (*e.g.*, cheap garden chairs) to decidedly high-tech inventions (*e.g.*, light emitting polymers for the next generation of flat screen displays). While many people are aware of the problems caused by the large volumes of polymer waste that are produced, rather less attention is given to the methods by which these polymers are manufactured. In particular, polymer production is often accompanied by the use of large volumes of organic solvents, most of which are highly damaging to the environment.



Our research in Liverpool has two main goals. Firstly, we are interested in developing methods for the synthesis of polymers by more environmentally responsible methods. To do this, we are exploring the use of carbon dioxide (CO_2) as a "green" solvent for polymer synthesis and processing. In many ways CO_2 is an ideal solvent because it is non-toxic, non-flammable and inexpensive. Under normal conditions CO_2 exists as a gas. However, at sufficiently high pressures, the density of CO_2 becomes much higher and the gas starts to behave more like a liquid solvent. By using CO_2 in this way, we hope to develop clean routes for polymer synthesis. The second goal of our research is to synthesise "smart" polymers with advanced physical properties (*e.g.*, see microspheres in Figure). For example, smart materials might be used in chemical separations or as catalysts (*i.e.*, to make chemical reactions occur faster or at lower temperatures). Our ultimate goal is a combination of both strategies: to produce new smart materials through the use of alternative green solvents.

For more details, see our web page at http://www.liv.ac.uk/Chemistry/Staff/coopera.html