

Poster GC4

Supercritical CO₂ Effects on the Cross-Link Density During the Formation of Microgel Particles

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Supercritical CO₂ (scCO₂) has the ability to penetrate effectively between polymer chains plasticising and reducing the glass transition temperature (T_g) of polymers. [1] scCO₂ induced changes in the properties observed such as the T_g can have a dramatic effect on final polymer morphology and properties. [2,3] Whilst this may be relatively simple to study with soluble straight-chain polymers, lightly cross-linked polymers such as microgel particles are difficult to study.

A lot of research has been performed on controlling complex materials under scCO₂. [4] A better understanding of how scCO₂ influences the synthesis of such complex materials will enable scCO₂ to be realistically considered as a replacement solvent.

In this study we have followed the change in the cross-link density of polymers generated under different conditions of scCO₂ using mechanical tests such as dynamic mechanical analysis and high-pressure Rheology. In addition we have utilised solid state NMR, to probe the effects of pressure and temperature on the precipitating microgel particles.

References

- [1] JORDAN, F., NAYLOR, A., KELLY, C.A., HOWDLE, S.M., LEWIS, A., ILLUM, L., *Journal of Controlled Release*, Vol.141, **2010**, p.153
- [2] LIU, T., GARNER, P., DeSIMONE, J.M., ROBERTS, G.W., BOTHUN, G.D., *Macromolecules*, Vol.39, **2006**, p.6489
- [3] CAO, G.P., LIU, T., ROBERTS, G.W., *Applied Polymer Science*, Vol.115, **2010**, p.2136
- [4] JENNINGS, J., BEIJA, M., RICHEZ, A.P., COOPER, S.D., MIGNOT, P.E., THURECHT, K.J., JACK, K.S., HOWDLE, S., *Journal of the American Chemical Society*, Vol.134, **2012**, p.4772