

Responsive Microgels: Using pH-triggered Gelation to Restore the Mechanical Properties of Load-bearing Human Tissue

Sarah Lally, Robert Bird, Brian R.Saunders

Manchester Materials Science Centre, School of Materials, The University of Manchester, Grosvenor Street, Manchester M1 7HS

Abstract

Degenerated load-bearing soft tissue can cause a great deal of problems as there are no real treatment other than conservative therapies and debilitating surgery. Over 40% of lower back pain is due to intervertebral disc (IVD) degeneration¹, caused by the dehydration of the nucleus pulposus. Current solutions are highly invasive and can result in degeneration to adjacent discs and therefore a minimally invasive solution is highly sort after. Poly(ethyl acrylate/ methacrylic acid/ butane diol diacrylate) has been used as a model system for a pH responsive microgel due to its suitable mechanical properties and abilities to form a gel at physiological pH. Its toxicity, however, requires a biocompatible alternative for implantation. Methyl methacrylate based microgels of various compositions have been synthesised and tested in order to recreate the mechanical properties of the model system, with promising biological results.

1. B. Saunders, T. Freemont, *Chem Sci*, (2008) 5, C41-C48