

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Nanoparticle-reinforced associative PLA-PEO-PLA hydrogels
SARVESH AGRAWAL, NAOMI SANABRIA-DELONG, SURITA BHATIA, GREGORY TEW, University of Massachusetts Amherst — Hydrogels of poly(lactide)-poly(ethylene glycol)-poly(lactide) have potential applications in drug delivery and tissue engineering. Control over the structure and rheology of the gels is of fundamental importance for the use of this polymer in medical applications. We have performed a complete rheological and structural characterization of these hydrogels using dynamic mechanical rheology, SANS, and USAXS. These polymers form very stiff hydrogels and the structure and properties of these materials can be substantially modified by varying the crystallinity or degree of polymerization (DP) of the hydrophobic PLA block. We have also created reinforced hydrogels with enhanced mechanical properties by addition of laponite nanoparticles. Our recent studies show that the elasticity of the PLA-PEO-PLA hydrogels can be enhanced by orders of magnitude by addition of small amounts of laponite particles to the hydrogels. It is expected that the triblock copolymer micelles adsorb on the surface of the laponite particles to form additional junctions in the hydrogels leading to enhancement in their elasticity. We verify this hypothesis using DLS and SANS techniques.

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Date submitted: 13 Dec 2005

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