Osmotic Pressure Measurements of the Order Disorder Transition in Acrylic Triblock Copolymer Gels

RAFAEL E. BRAS, Northwestern University, KENNETH R. SHULL, Northwestern University — Semi-dilute solutions of PMMA-PnBA-PMMA triblock co-polymers in alcohols are excellent binder materials for a novel ceramics processing method, thermo-reversible gel casting. Processing methods based on this technology offer a low cost alternative to traditional slip and gel casting techniques. The rapid transition of these gels from freely flowing liquids to elastic solids has been attributed to the aggregation of the PMMA endblocks to form small spherical domains. We have recently begun to examine the order disorder transition of the PMMA endblocks with vapor pressure osmometry. This technique measures osmotic pressure by monitoring the equilibrium temperature of a solution droplet relative to the temperature of a pure solvent droplet. Measurements of solutions consisting of 15 vol % acrylic triblock copolymer in butanol show a significant drop in osmotic pressure between 80 and 85 °C. This result indicates that the relaxation times of the ordered gels can be quite low, so that the order-disorder transition of the triblock copolymer occurs at temperatures higher than the rheologically determined gelation temperature of about 65 °C.

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