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Low Temperature Processing of Core-Shell Baroplastics JUAN A. GONZALEZ LEON, SANG-WOOG RYU, SHELDON A. HEWLETT, JEFFREY A. BOROWITZ, ANNE M. MAYES, Massachusetts Institute of Technology, DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING COLLABORATION — Baroplastics are nanophase materials that exhibit the ability to flow and be molded under pressure at reduced temperatures. Core-shell nanoparticle baroplastics comprised of one soft component, such as poly(butyl acrylate), and one glassy component, such as polystyrene, were synthesized by miniemulsion polymerization and processed at temperature as low as 25°C by compression molding and extrusion. The resulting specimens are clear and well-defined solid objects with a diverse range of mechanical properties depending on composition, ranging from tough, rigid materials to rubbery materials comparable to commercial thermoplastic elastomers. SANS and DSC measurements on the core-shell materials before and after processing reveal pressure induced partial mixing of the hard and soft components, while TEM studies show that the core-shell morphology is substantially retained, even after 20 reprocessing cycles. Mechanical properties of the processed samples were measured to elucidate the effects of processing pressure and temperature and to isolate the role of the pressure-induced miscibility.

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