

352b Low Temperature Fusion of Polymeric Nanostructures Using Carbon Dioxide

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Low temperature assembly techniques are desirable for evolving polymer-based MEMS (MicroElectroMechanical Systems)/NEMS (NanoElectroMechanical Systems), especially for systems containing biomolecules and cells. By applying low pressure carbon dioxide, we are able to manipulate polymer chain mobility at the nanoscale far below the bulk glass transition temperature of polymers. Atomic force microscopy and neutron reflectivity studies reveal a pressure-tunable width of the surface rubbery layer. Guided by this phenomenon, we successfully demonstrate low temperature fusion of polymeric nanostructures with small compressive force. This biologically benign technique has potential for assembly of three-dimensional micro/nanoscale polymeric devices for biomedical applications.