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Effect of Microstructural Order on Plasticity in Thin PS-P2VP Films BEKELE GURMESSA, ANDREW B. CROLL, Department of Physics, North Dakota State University — We report the results of an experimental investigation of the onset of plastic deformation in polystyrene-b-poly (2-vinylpyridine) (PS-P2VP) thin films. PS-P2VP is a glass-forming diblock copolymer which serves as a model material for the study of the effects of microstructure on mechanical response due to the similarities of the mechanical properties (glass transition temperature, entanglement molecular weight, and bulk elastic modulus) of each block. In particular, we measure the onset of plasticity using an elastic instability technique to locally bend and locally impart a tensile stress in a thin film that is subsequently examined for damage. Similar to our earlier results from experiments conducted on homopolymer polystyrene, we show that failure in PS-P2VP is initiated at extremely low strain and that the failure strain is influenced by thin film confinement effects. For the first time, we show that the onset of plasticity increases as a sample is annealed from a disorganized, as-cast state to that of a film with a well ordered internal microstructure.

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