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Different Effects of Confinement on the Glass Transition Behavior of Supported Polymer Films and Model Polymer Nanocomposites Made with Carbon Based vs. Silica Based Substrates LAWRENCE CHEN, JOHN TORKELSON, Northwestern University — While the effect of confinement on the glass transition temperature, Tg, of polymeric materials has been studied for two decades, only limited work has focused in a systematic way on the effect of different substrates, in the case of polymer films, or different nanofillers, in the case of nanocomposites. We employ both silica based and carbon based substrates on which films have been spin coated to study how the potential for pi-pi bonding interactions between polymer and substrate can modify the Tg-confinement effect in thin polystyrene (PS) films. Characterization is done in single-layer supported films by fluorescence spectroscopy and ellipsometry and in multilayer films by fluorescence. Model nanocomposite studies are also done by layering films supported on substrates, yielding a film sandwiched between substrates. Major differences in the Tg-confinement effect are observed in sufficiently thin PS films, with silica supported films possessing a free surface exhibiting major Tg reductions while the carbon supported analogs exhibit little Tg reduction. Bilayer film studies demonstrate an enhancement in Tg in a sufficiently thin PS layer in contact with a carbon substrate, which is not observed with a silica substrate.

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