

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Effect of molecular weight on gold nanoparticle embedding into polystyrene films near and below the bulk glass transition temperature
CHAD DALEY, DONGPING QI, JAMES FORREST, University of Waterloo — We use gold nanoparticle embedding to probe the surface properties of glassy polystyrene films at temperatures ranging from a few degrees above to 10's of degrees below the bulk glass transition temperature (T_g). These studies employed monodisperse polymer samples with molecular weights (M_w) ranging from 3000-80000 kg/mol. A qualitative change in the surface response is observed between the high M_w and low M_w regimes. At low M_w a buildup of polymer material forms around the base of the nanoparticles similar to the observed behavior in molecular glasses. For the higher molecular weights this buildup is not observed and the system instead relaxes through nanoparticle embedding. We also observe changes in the complete embedding process observed only near the bulk T_g . These changes suggest that nanoparticle embedding can be used as a probe of polymer entanglements.

Chad Daley
University of Waterloo

Date submitted: 19 Nov 2010

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