MAR08-2007-002541

Abstract for an Invited Paper
for the MAR08 Meeting of
the American Physical Society

A model for glass transitions in polymer thin films.[1]

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Polymeric materials formulated as thin films can exhibit glass transition temperatures which are significantly shifted relative to bulk values. Depending on whether the film is supported (on a substrate) or freely-standing the temperature shift can go in different directions relative to the bulk. For all films the magnitude of the shift depends on film thickness. For supported films the shift appears to depend on substrate-polymer interactions, while for free-standing films there is a striking dependence on molecular weight. Experimental data published over the last five years have included some elegant and intriguing results which provide a significant challenge for those wishing to understand these phenomena. In this talk a model that predicts glass transitions in both free-standing and supported films will be presented and tested against extant data. Ideas for future experiments will also be discussed.

[1]Work done in collaboration with Scott Milner, ExxonMobil Research and Engineering.