Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

The Calorimetric Glass Transition of Polystyrene Ultrathin Films

SIYANG GAO, YUNG P. KOH, SINDEE S. SIMON, Texas Tech University, TEXAS TECH UNIVERSITY TEAM — The glass transition temperature (Tg) for nanoconfined materials have been widely studied since the early 1990s. For supported polystyrene ultrathin films, Tg differs from bulk value. Recent work has attributed nanoconstrained Tg effects to artifact. In this study, we attempted to resolve this controversy and measure Tg for single polystyrene ultrathin films using Flash DSC. Films have been prepared in two ways: spincast films placed on a layer of inert oil or grease and films directly spincast on the back of the calorimetric chip. For the films on oil or on grease, the 160 nm thick films show no Tg depression. On the other hand, thinner films on oil and on grease show a Tg depression which decreases with increasing cooling rate. The depression reverts to the bulk values over the course of a day at 160 °C due to dewetting and thickening. For directly spincast films, no Tg depression is observed, consistent with results from other nanocalorimetry work. Our results are consistent with literature results that Tg decreases with decreasing substrate surface energy, and they also demonstrate that the Tg depression observed is not due to degradation or to plasticization effects.

Siyang Gao
Texas Tech University

Date submitted: 19 Nov 2012 Electronic form version 1.4