The Calorimetric Glass Transition of Polystyrene Ultrathin Films

SIYANG GAO, YUNG P. KOH, SINDEE SIMON, Texas Tech University — Although the glass transition behavior of polystyrene ultrathin films has been widely studied, calorimetric measurements are limited due to difficulties in sample preparation. Here we report the use of a rapid scanning calorimeter based on a membrane sensor to measure the rate-dependent glass transition temperature (T_g) for single ultrathin films. Both microtomed and spin-coated films are investigated. Preliminary results suggest that the magnitude of the T_g depression is similar to that observed for freely-standing films. The T_g depression also depends on the cooling rate such that at the highest rates used (1000 K/s), the depression is only a few degrees. The kinetics of dewetting are followed, with T_g values increasing as a function of time and finally reverting to the bulk values after several hours at 160 °C.

1National Science Foundation DMR-1006972