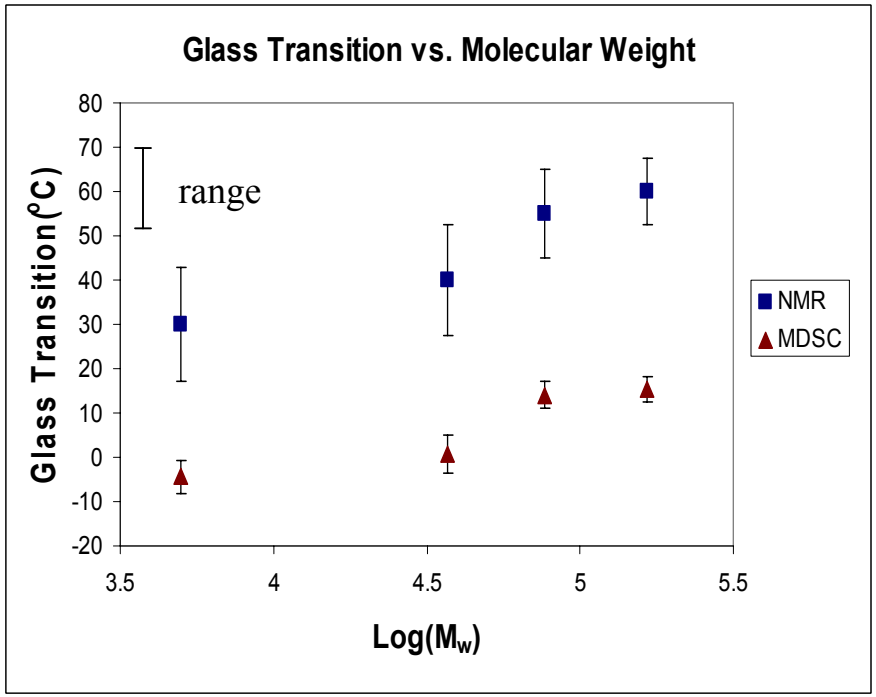
Dynamics in Polymeric Thin Films

Frank D. Blum, University of Missouri-Rolla, DMR-0412320

Most linear polymers undergo glass transitions (T_g), where the materials go from hard brittle glasses to flexible rubbery substances. These transitions affect whether a polymer can be used for a given application. We are interested in how the glass transitions of polymers with different molecular weights are modified by the presence of a surface. In order to understand the molecular weight effects, we probed the glass transition behavior with both modulated differential scanning calorimetry (MDSC) and deuterium nuclear magnetic resonance (DNMR) spectroscopy. Shown in the figure are the measured T_gs from the two different experiments. Both experiments showed similar results with the differences resulting from the differences in time scales of the two experiments.



Glass transition temperatures for poly(methyl acrylate) (PMA), as a function of molecular weight, as measured by modulated differential scanning calorimetry(MDSC) and deuterium nuclear magnetic resonance (NMR) spectroscopy.

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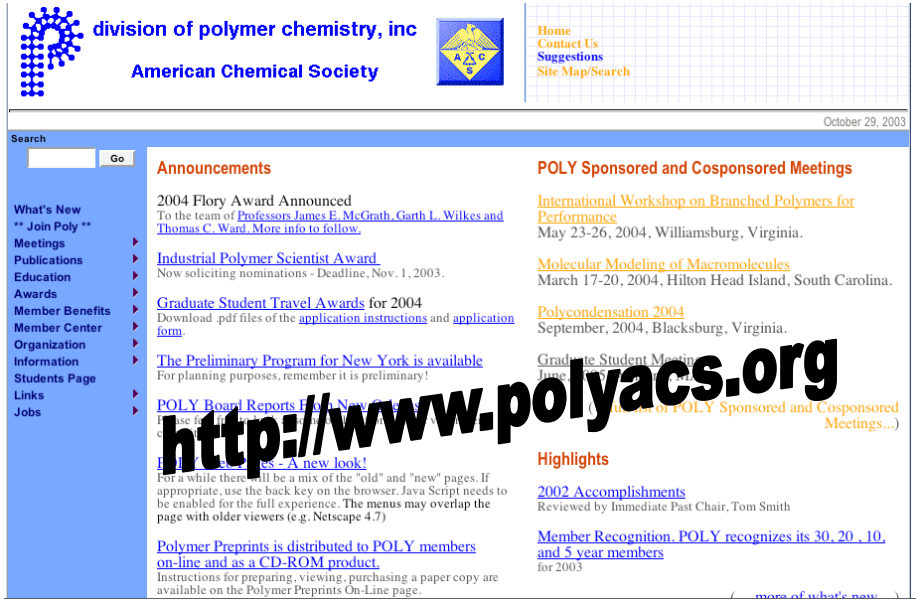
Education:

Support from this NSF grant (and its predecessor) allowed the following students to complete their degrees: Erin Young (MS 2004, at ExxonMobil); Bing Zhang (PhD 2003, at GE), Bhavesh Gandhi (MS 2002, at Milliken); and Crystal Porter (PhD 2001, at Loreal). In addition, Undergraduates Greg Smith (currently at U. Bristol, England) and graduate students Burak Metin, Macduff Okuom, and Mani Nair (all at UMR) have worked on this research.

Outreach:

The PI participates in many education-related activities, including service to the American Chemical Society (ACS) and Division of Polymer Chemistry (POLY).

See: http://www.umr.edu/~fblum



The PI is webmaster for POLY. The web site has information and links on education and science for students, professionals, Division members and the public.