Canadian Association of Physicists

Association canadienne des physiciens et physiciennes

Contribution ID: **4126** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Measurement of the depth-dependent local dynamics in thin polymer films through rejuvenation of ultrastable glasses

Monday 27 May 2024 17:00 (15 minutes)

We measure the isothermal rejuvenation of stable glass films of poly(styrene) and poly(methylmethacrylate). We demonstrate that the propagation of the front responsible for the transformation to a supercooled-liquid state can serve as a highly localized probe of the local supercooled dynamics. We use this connection to probe the depth-dependent relaxation rate with nanometric precision for a series of polystyrene films over a range of temperatures near the bulk glass transition temperature.

The analysis shows the spatial extent of enhanced surface mobility and reveals the existence of an unexpected large dynamical length scale in the system.

The results are compared with the cooperative-string model for glassy dynamics. The data reveals that the film-thickness dependence of whole film properties arises only from the volume fraction of the near-surface region. While the dynamics at the middle of the samples shows the expected bulk-like temperature dependence, the near-surface region shows very little dependence on temperature.

Keyword-1

Ultra-stable Glasses

Keyword-2

Polymer Glasses

Keyword-3

Rejuvenation

Author: KARIMI, Saba

Co-authors: YIN, Junjie; FORREST, James (University of Waterloo); SALEZ, Thomas

Presenter: KARIMI, Saba

Session Classification: (DCMMP) M3-6 Soft Condensed Matter III | Matière condensée molle III (DPMCM)

Track Classification: Technical Sessions / Sessions techniques: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)