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Dielectric Relaxation of Materials that Form Ultra-Stable Glasses

RANKO RICHERT[1], Arizona State University

Physical vapor deposition of glass forming materials onto substrates at temperatures around 0.8 Tg produces glasses of high density and low enthalpy. Using interdigitated electrode cells as substrates, such stable glasses can be studied by dielectric spectroscopy in situ. This technique is applied to monitor the dynamics of stable films upon their conversion to the ordinary supercooled liquid state. The dielectric loss during transformation indicates that the softening proceeds by a growth front mechanism and generates the ordinary liquid state without forming intermediates. The same technique is also used to assess the residual dynamics of the stable glassy state. We observe that processes such as the Johari-Goldstein beta relaxation are strongly suppressed in this stable state, consistent with the relatively low fictive temperature of these glassy states.

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[1]coauthors: Hai-Bin Yu, Department of Chemistry and Biochemistry, Arizona State University, Tempe, Arizona 85278; Michael Tylinski, and Mark D. Ediger, Department of Chemistry, University of Wisconsin-Madison, Madison, Wisconsin 53706.