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Exploring the existence of two Tgs in thin, supported polymer films[1] ERIC CHEN, ETHAN GLOR, GABRIEL ANGRAND, ZAHRA FAKHRAAI, Univ of Pennsylvania, FAKHRAAI GROUP TEAM — Ellipsometry has commonly been used to characterize the glass transition temperature (Tg) and other properties of nanoscale thin films. In some ultra-thin films the glass transition broadens and even becomes two distinct transitions, as previously observed in free-standing polystyrene, thin films. However, for most polymers, the second, lower T_g is located below the condensation temperature of water, generating large errors in determining the lower Tg, which is associated with the layer close to the free interface. Here we designed a vacuum stage with a base pressure of $<1_{E-4}$ torr, equipped with a Linkam temperature stage with a temperature range of 153 K-873 K to study the properties of thin polymer films, supported on a substrate, in a broad temperature range and explore the existence of two Tgs in these systems. The stage was machined from aluminum and used infrasil quartz windows to allow the transmission of polarized light without distortion. The vacuum allows for accurate ellipsometry measurements of the properties of thin polymer films, such as expansion coefficient and Tg, at temperatures well below room temperature, without artifacts due to water condensation.

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