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Glass Transition in Thin Supported Polymer Films Probed by Temperature-Modulated Ellipsometry in Vacuum MIKHAIL EFREMOV, PAUL NEALEY, Department of Chemical and Biological Engineering, University of Wisconsin - Madison, Madison, WI 53706 — Glass transition in model glass-forming polymer coatings is probed by ellipsometry in vacuum. Novel temperature-modulated modification of the technique is used alongside with traditional linear temperature program [1]. Spin-cast 2 - 200 nm thick polystyrene (PS) and 10 - 200 nm thick poly(methyl methacrylate) (PMMA) films on silicon are studied. Measurements are performed at $10^{-6} - 10^{-8}$ torr residual gas pressure. Temperature modulation allows effective separation of reversible glass transition from accompanying irreversible processes. It is found that glass transition in both polymers demonstrates no appreciable dependence on film thickness for more than 20 nm thick coatings. The temperature of the transition (T_g) in thinnest PS films does depend on film thickness, but does not follow often accepted $T_g(h) = T_g(\infty)[1 - (\frac{A}{h})^{\delta}]$ function (where h is film thickness, A and δ are constants). Effects of polymer molecular weight and substrate surface pre-treatment on glass transition will be discussed also.

[1]. M. Yu. Efremov, A. V. Kiyanova, and P. F. Nealey, Macromolecules, 41, 5978 (2008).

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