

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Instrumentation origin of the glass transition temperature depression in thin films measured by ellipsometry MIKHAIL EFREMOV, Department of Chemical and Biological Engineering, University of Wisconsin-Madison, Madison, WI 53706, PAUL NEALEY, Institute for Molecular Engineering, University of Chicago, Chicago, IL 60637 — Ellipsometry is one of the standard methods for observation of glass transition in thin films. However, sensitivity of the method to surface morphology can complicate the manifestation of the transition in a few nm thick samples. In particular, an onset of the free surface roughness in the glass transition temperature range affects the experimental data in a way that leads to biased glass transition temperature assignment. Two possible mechanisms of surface roughening in the vicinity of glass transition are discussed: the roughness due to lateral heterogeneity and roughness associated with thermally activated capillary waves. Effective medium approximation models are used to introduce the surface roughness into optical calculations. The results of optical modeling for a 5 nm thick polystyrene film on silicon are presented.

Mikhail Efremov
Department of Chemical and Biological Engineering,
University of Wisconsin-Madison, Madison, WI 53706

Date submitted: 11 Nov 2013

Electronic form version 1.4