Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Measuring Surface Diffusion of Organic Glasses Using Tobacco Mosaic Virus as Probe Nanoparticles[1] YUE ZHANG, RICHARD POTTER, ZAHRA FAKHRAAI, Department of Chemistry, University of Pennsylvania — Recent studies have shown that diffusion on the surface of organic glasses can be many orders of magnitude faster than bulk diffusion, with lower activation barrier. Developing new probes that can readily measure the diffusion at the surface of an organic glass can help study the effect of chemical structure and molecule's size on the enhanced surface diffusion. In this study, surface diffusion coefficient of molecular glass (TPD) is measured using tobacco mosaic virus (TMV) as probe particles. TMV is placed on the surface of bulk TPD films. The evolution of the meniscus formed around TMV, driven by curvature gradient, is probed at various temperatures. TMV has a well-defined cylindrical shape, with a large aspect ratio (18 nm wide, 300 nm long). As such, the shape of the meniscus around the center of TMV is semi-one dimensional. Based on the self-similarity nature of surface diffusion flow in one dimension, the surface diffusion coefficient and its temperature dependence are measured. It is found that the surface diffusion is greatly enhanced and has weak temperature dependence compared to bulk counterpart, consistent with previous studies, showing that TMV probes serve as an efficient method of measuring surface diffusion.

[1]NSF-CAREER DMR-1350044

Yue Zhang
University of Pennsylvania

Date submitted: 02 Nov 2015 Electronic form version 1.4