Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spatio-spectral infrared vibrational nano-imaging of intermolecular coupling BENJAMIN POLLARD, ERIC MULLER, MARKUS RASCHKE, Univ of Colorado - Boulder — Molecular self-assembly, the function of biomembranes, and the performance of organic solar cells rely on molecular interactions on the nanoscale. The understanding and design of such heterogeneous functional soft matter has long been impeded by a lack of spectroscopic tools with sufficient nanometer spatial resolution, attomolar sensitivity, and intermolecular spectroscopic specificity. We implement vibrational scattering-scanning near-field optical microscopy (*s*-SNOM) in a multi-spectral modality to investigate the structure-function relationship in PS-*b*-PMMA block copolymers. Using a vibrational resonance as a sensitive reporter of local structure, coupling, and dynamics, we resolve spectral Stark shifts and line broadening correlated with molecular-scale morphologies. By creating images of solvatochromic vibrational shifts we discriminate local variations in electric fields between nanoscale bulk and interface regions, with quantitative agreement to dielectric continuum models. This new nano-chemometric ability to directly resolve nanoscale morphology and associated intermolecular interactions can form a basis for the systematic control of functionality in multicomponent soft matter systems.

Benjamin Pollard
Univ of Colorado - Boulder

Date submitted: 14 Nov 2013 Electronic form version 1.4