Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

The influence of deformation rate on polymer nanomechanical properties as measured by Atomic Force Microscopy. BEDE PITTENGER, THOMAS MUELLER, Bruker Nano, AFM UNIT TEAM — Polymeric composites often have heterogeneities at the nanometer length scale. AFM based mechanical property measurements have the sensitivity and resolution necessary to visualize these features and better understand their influence on bulk properties. In the past few years, AFM mechanical property mapping has evolved from slow force volume to faster, but conceptually very similar, PeakForce Tapping. Currently, the time scale of tip-sample interaction spans from microseconds to seconds, tip sample forces can be controlled from piconewtons to micronewtons, and spatial resolution can reach sub-nanometer. AFM has become a unique mechanical measurement tool having large dynamic range (1kPa to >100GPa in modulus) with the flexibility to integrate with other physical property characterization techniques in versatile environments. In particular, researchers have begun to take advantage of the wide range of deformation rates accessible to AFM in order to study time dependent properties of materials such as viscoelasticity. This presentation will review this recent progress, providing examples that demonstrate the dynamic range of the measurements and the resolution with which they were obtained. Additionally, the effect of time dependent material properties on the types of measurements will be explored.

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Date submitted: 06 Nov 2015 Electronic form version 1.4