

# CHARACTERIZATION AND MODELING OF THE INTERFACE/INTERPHASE OF POLYMERIC MATERIALS AND SYSTEMS CONSORTIUM

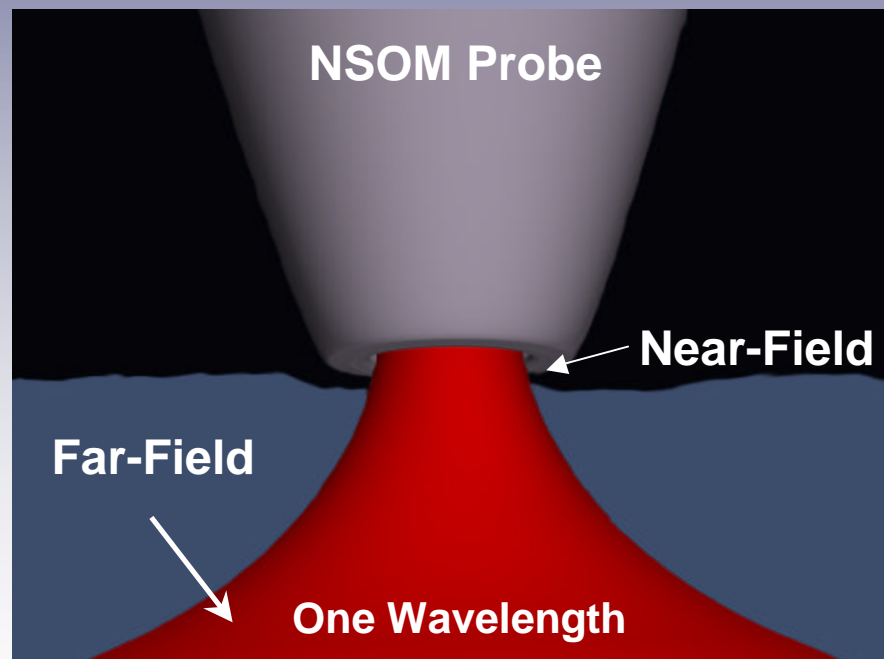
## Project 3 – Milestone 4:

*Development of new nanoscale techniques using NSOM, NLO, and SIMS to evaluate changes in chemical composition in interphase regions.*

**Nanoscale Characterization of Chemically Heterogeneous Samples via Spatially Resolved Vibrational Spectroscopy.**

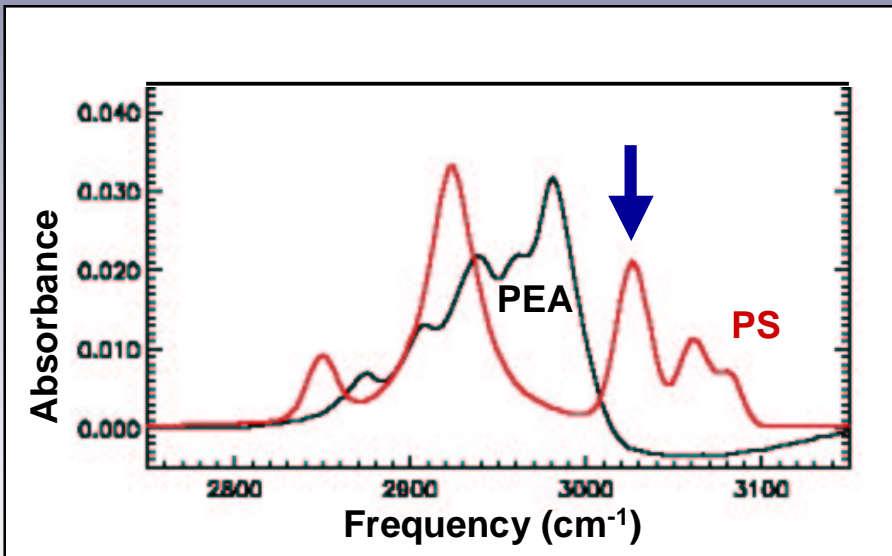
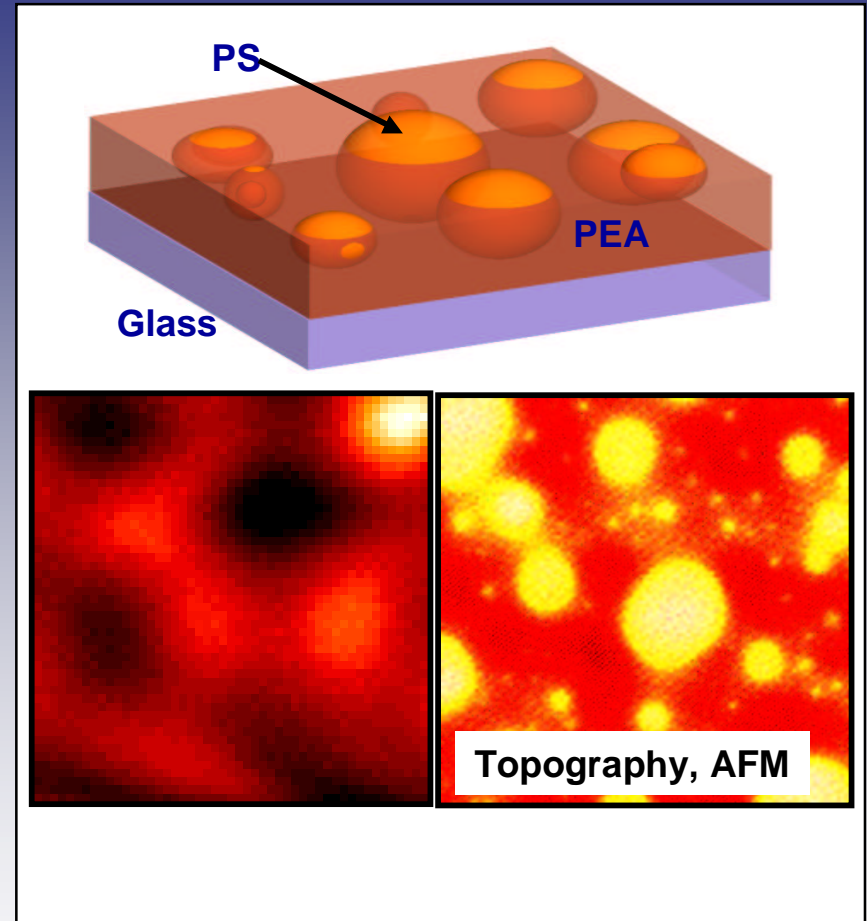
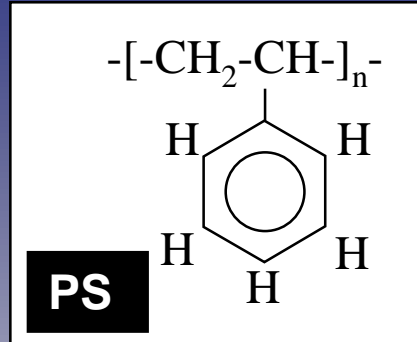
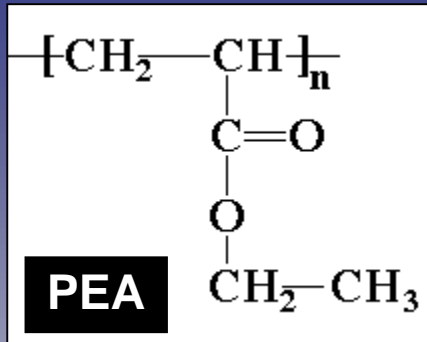
### Near-Field Vibrational Spectroscopy

- Lateral resolution set by aperture size rather than diffraction.  
Raman ~ 100 nm; IR ~ 300 nm
- Chemical composition information from vibrational spectra.



# INFRARED NSOM

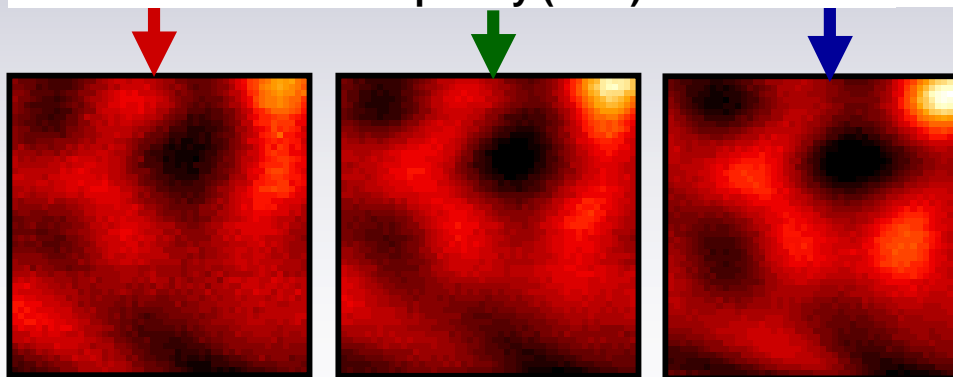
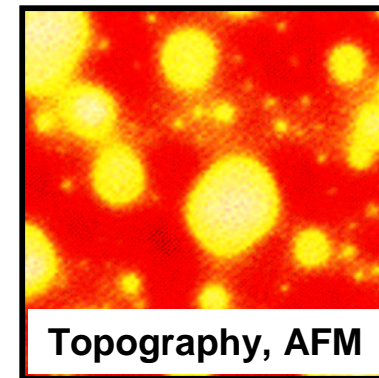
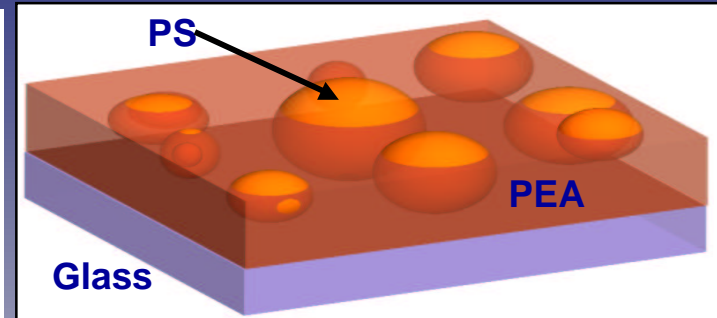
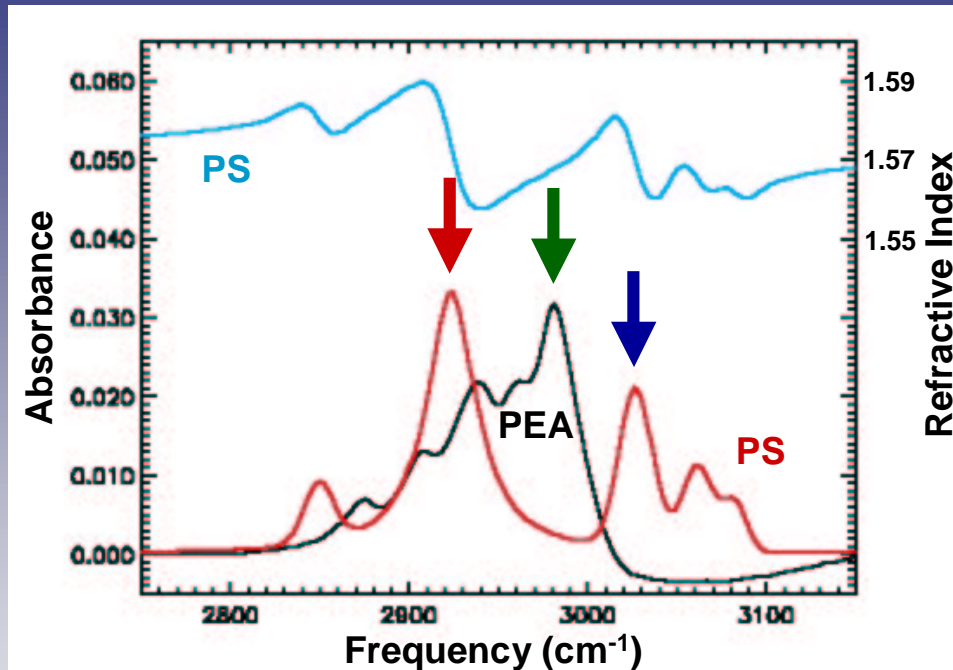
## - IMAGING OF POLYETHYLACRYLATE/POLYSTYRENE BLENDS



**8 μM IMAGES: INCLUSIONS – PS ? CONTINUUM – PEA ?**  
**USE IR RESONANT ABSORPTION AS CONTRAST MECHANISM**

# INFRARED NSOM

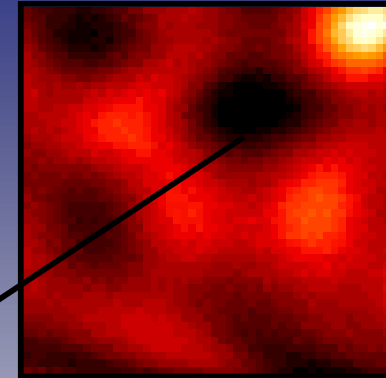
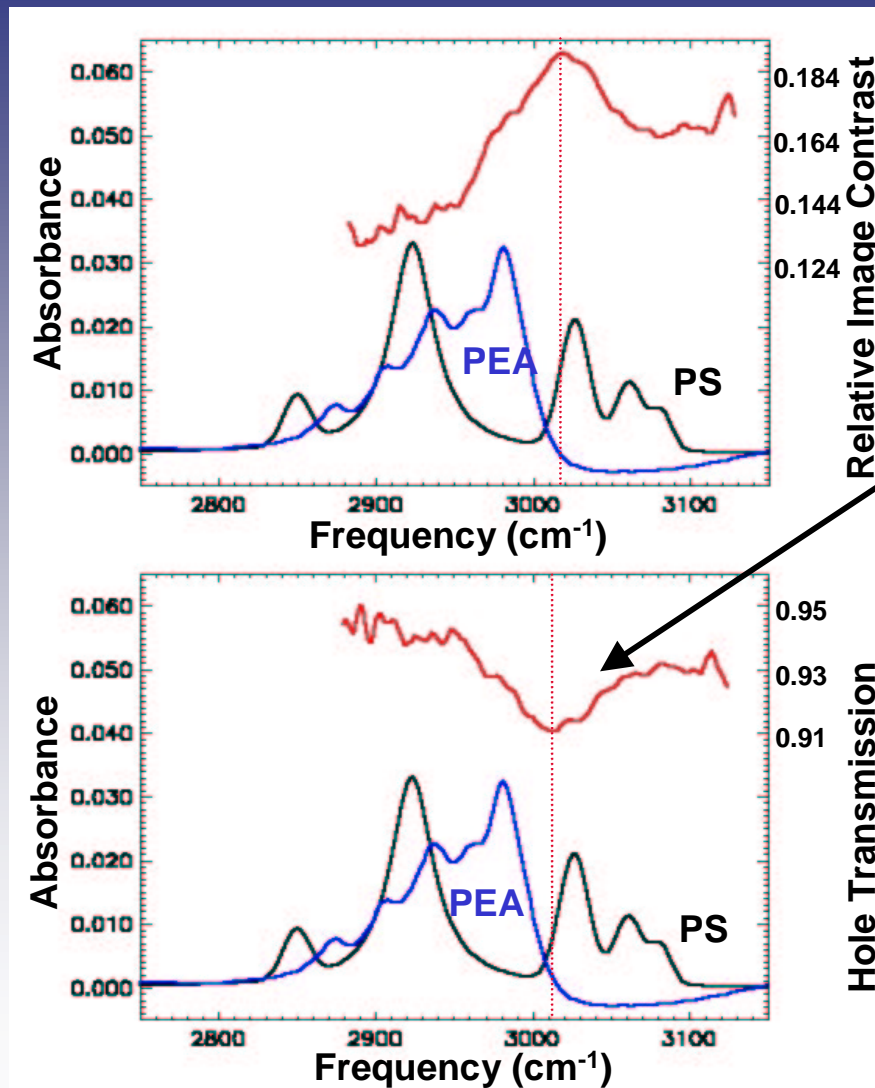
## - IMAGING OF POLYETHYLACRYLATE/POLYSTYRENE BLENDS



**8 μm IMAGES**

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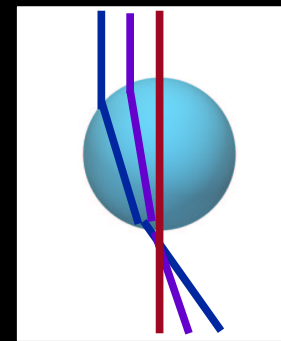
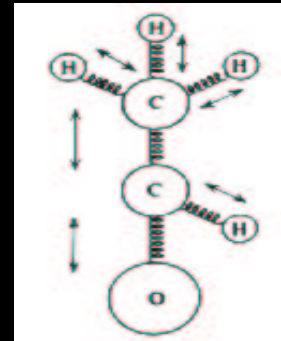
## - CHEMICAL IMAGING OF POLYMER BLENDS



**Absorptive/Refractive Contrast?**

Next: See what impact NA has on contrast.

Develop accurate model



# NANOSCALE CHEMICAL IMAGING: YEAR ONE MATERIALS

- Mid  $T_g$  epoxy - Raman microprobe
- Fluorescence dominates (532 nm)

- PMMA – Near-field IR absorption
- Thickness limit  $\sim 0.5 \mu\text{m}$

