Morphology of Thin Film Polymer Blends Containing Nanoparticles

Russell Composto, University of Pennsylvania, DMR-0234903

Polymer thin films are utilized in extremely diverse technologies ranging from electronic devices to tissue engineering. To optimize properties, films typically contain multiple components, each playing a different role. In this project we have added nanoparticles (NP) of silica to control the rate of phase separation as well as phase size and morphology. The addition of NP provides a new handle to control film properties important for their processing and opto-electronic properties.

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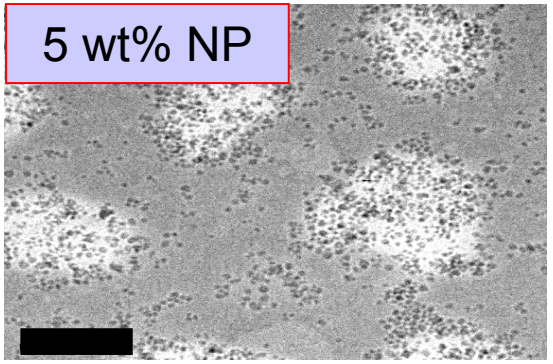
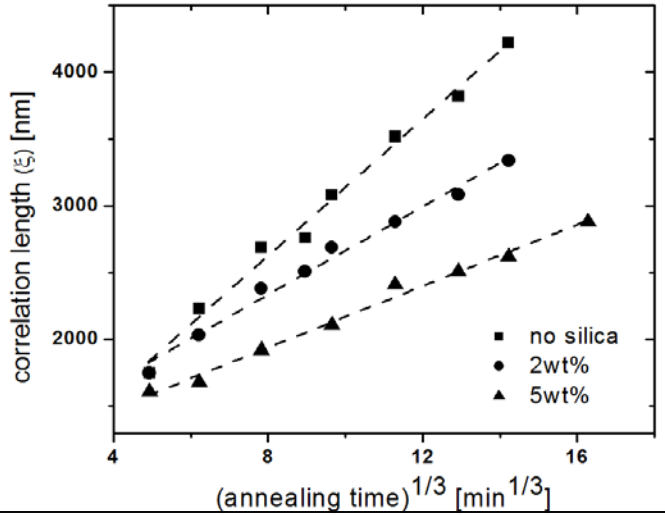


TEM image of PMMA domains (light) surrounded by an SAN matrix (gray). The NP's (dark) have partitioned into the PMMA rich domains.



Kinetics of phase separation is slowed by the addition of NP's.

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Outreach: During the 03-04 funding period, ten undergraduates and one high school teacher participated in polymer related research. For example, Andro Pierre-Louis (Philadelphia Community College), an NSF-REU student, explored patterning of elastomers using a focused ion beam and Mamadou Kane (Masterman High, Philadelphia), an NSF-RET student, used electrospinning to prepare nanotextured polymer substrates.

Education: During the Spring 04 term, the PI incorporated polymer chemistry and principles into *Chemistry 102*, a physical chemistry course with 150 students from mechanical, materials, bioengineering and chemical engineering..

NSF-RET students supported by NSF/MRSEC. Mr. Kane (rear, right) was in the Composto group. Mr. Pierre-Louis (inset) was an NSF-REU student from Philadelphia Community College. Lauren Costello (not pictured) was also an NSF-REU sponsored student.