

# Industrial Applications of Scanning Transmission X-Ray Microscopy at The Dow Chemical Company

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We have been using the scanning transmission x-ray microscope (STXM) at the 5.3.2 beamline at the Advanced Light Source for submicron materials characterization to provide understanding and feedback for new materials design projects at Dow. STXM provides the useful ability to measure molecular composition at the 35 nm spatial scale for determining the chemical structure of polymers and other soft matter. For instance, additive dispersion in polymeric materials can impact polymer properties. An example of the application of STXM to understanding the distribution of additive in a bulk polymer is shown in Figure 1. STXM was able to detect the concentration in the bulk and when the additive levels were high enough, detect phase separation or precipitation of the additive into particles. Taking advantage of the dipole selection rules for near edge x-ray absorption fine structure (NEXAFS) spectroscopy, one can also learn about the molecular orientation of polymers. This poster will share some recent applications of STXM to industrial research and development projects at Dow.

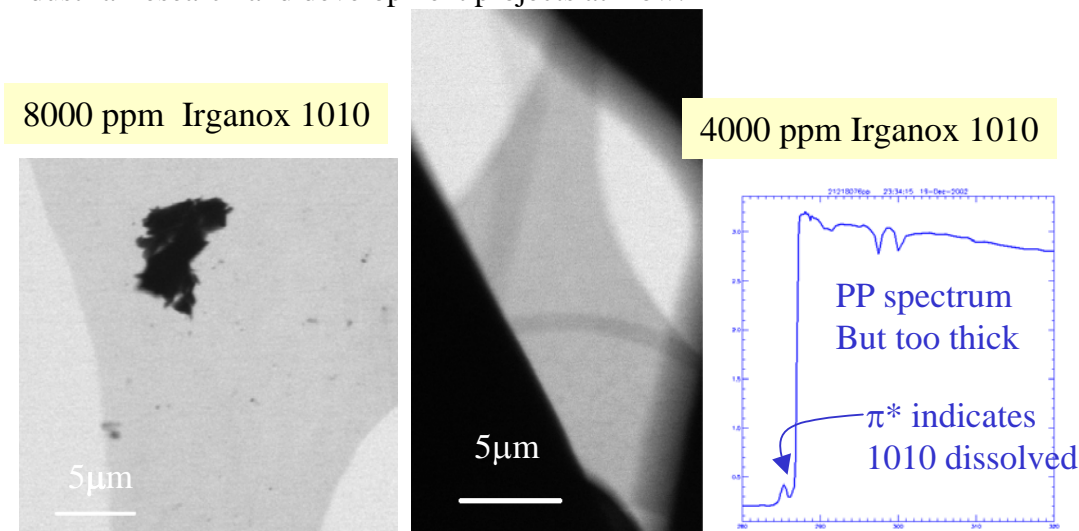


Figure 1. STXM images of PP foam sections containing 8000ppm (left) and 4000ppm (right) Irganox 1010 antioxidant additive.