Microstructure Evolution in Solvent-Swollen Polyolefin Clay Nanocomposites

Sponsor: Center for Packaging Innovation and Sustainability, MSU; Collaborators: M. Rubino, R. Auras, MSU

The objectives of this research are (a) to investigate the effects of exposing individual components such as the organoclay and compatibilizer to solvents and then making and characterizing the nanocomposite obtained with the treated clay and (b) to investigate the effects of exposing the compounded nanocomposite to solvents. The effects on structure have been investigated by running X-Ray diffraction patterns on the clay and on the composites prepared with the clay after various exposures. Polyolefin nanocomposite films 0.1 mm thick were exposed to a mixture of methanol and water with volume ratio 80:20, at 60°C. Since the organoclay contains 40 wt% organic surfactant, a mixture of methanol and water is the only way to get water to the components of the nanocomposite. The microstructure was evaluated with X-Ray diffraction on films after different times of exposure followed by drying under vacuum. X-Ray diffraction patterns of the dried films indicate much improved dispersion after 5 to 12 hours of exposure. This exposure has the effect of increasing the d-spacing within the composite significantly. This may be due to the conversion of the anhydride in the compatibilizer chain to acid or ester by water which enhances the interaction between the nanolayer surface and the “acidified” compatibilizer.