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Polymer nanocomposites: permeability, chain dynamics, mechanical properties LAXMI SAHU, NANDIKA D'SOUZA, Dept. of Materials Science and Engineering, University of North Texas, Denton, TX-76207 — Polymer nanocomposites based on dispersion of surfactant treated expandable smectite clays such as montmorillonite layered silicates (MLS) have shown promise as organic-inorganic hybrids with the potential to improve barrier properties. Separately, flexible displays based on plastic substrates have reduced lifetimes tied to the low barrier properties. While there has been a general attribution of improved barrier properties to the tortuous path, this does not consider the influence the introduction of a secondary filler has on the morphology of the host polymer. Here we examine the influence of MLS nanoplatelets on the barrier properties and chain dynamics of polymers. We investigate the potential for host polymer modification by comparing two crystallizable polymers nylon and PET and resulting well dispersed nanocomposites. We study mechanical, cyclic fatigue and permeability of films. Permeability of the biaxially stretched film and when the film undergoes fatigue of 50 and 10000 cycles are also measured. Chain dynamics were modeled based on the Burger model fit to creep-recovery data. A systematic approach to predict the permeability considering amorphous, crystalline and MLS content and comparison with experimental values were done. We also conducted water absorption measurements to highlight the water absorption differences in the two polymers. Dimensional stability of PET was studied by measuring coefficient of thermal expansion of thin film on Si substrate by ellipsometry method.

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