Polymer Diffusion in Single Wall Nanotube / Polystyrene Nanocomposites

MINFANG MU, RUSSELL J. COMPOSTO, KAREN I. WINEY

In addition to providing exception properties, single wall carbon nanotubes (SWNT) enable fundamental studies of polymer diffusion. SWNT and small SWNT bundles have high aspect ratios (> 30:1) and diameters on the order of nanometers, such that nanocomposites containing ~ 1wt% SWNT provide a fixed set of nanoscale obstacles. Here we will report our first results of polymer diffusion in these materials. A SWNT / polystyrene nanocomposite is prepared by a coagulation method and compression molding. Trace diffusion experiments are performed using deuterated polystyrene (dPS) where the concentration profile is characterized by forward recoil spectrometry (FRES) as a function of diffusion time and temperature. The SWNT filler, particularly with the creation of a SWNT network, inhibits the diffusion of dPS and the diffusion coefficient decreases by one order of magnitude in the nanocomposite.