

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Anisotropic Polymer Conformations in Aligned SWCNT/PS Nanocomposites¹ WEI-SHAO TUNG, RUSSELL COMPOSTO, University of Pennsylvania, NIGEL CLARKE, University of Sheffield, KAREN WINEY, University of Pennsylvania — In our previous study of isotropic SWCNT/polystyrene (PS) nanocomposites, we found that the polymer radius of gyration (R_g) increases and the SWCNT mesh size decreases with increasing SWCNT concentration. Here, we investigate the effect of aligning SWCNTs on R_g and the SWCNT mesh. SWCNT alignment was accomplished by melt fiber spinning or extrusion, and small angle neutron scattering was used to probe the structure. As expected, SWCNT alignment produces anisotropic meshes. Below 2 wt% SWCNT, no significant change in R_g is observed and R_g parallel and perpendicular to the direction of SWCNT alignment are comparable. More interestingly, at higher wt% SWCNT the polymer conformations are anisotropic with a larger R_g perpendicular to the SWCNT than along the SWCNT. For example, with 6 wt% SWCNT, the R_g perpendicular to the SWCNT is $\sim 15\%$ larger than parallel to the SWCNT. This anisotropy in the polymer conformation becomes more prominent at higher SWCNT concentrations, perhaps because at higher SWCNT concentrations the distribution of mesh shifts to smaller meshes ($<2R_g$) so that a single polymer chain interacts with multiple SWCNTs. Implications of this finding will be discussed.

¹National Science Foundation DMR-12-10379

Wei-Shao Tung
University of Pennsylvania

Date submitted: 14 Nov 2014

Electronic form version 1.4