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Segmental dynamics and atomistic motions in PMMA/SWNT composites RANA ASHKAR, UMCP/NIST, MANSOUR ABDULBAKI, University of Houston, MADHUSUDAN TYAGI, ANTONIO FARAONE, NIST Center for Neutron Research, PAUL BUTLER, NIST Center for Neutron Research and U. Delaware, RAMANAN KRISHNAMOORTI, University of Houston — The addition of single wall nanotubes (SWNT) to polymers has been repeatedly shown to have a significant impact on the macroscopic properties of the host polymer, including enhanced mechanical properties and shifts in the glass-transition temperatures, T_g. These properties usually result from collective structural and dynamical interactions of the polymer chains in the composite. Here, we investigate the effect of nanotubes on the polymer dynamics in PMMA composites with 10 wt% SWNT. Neutron spin echo (NSE) and backscattering (BS) are used in probing local polymer dynamics in deuterated samples and atomistic hydrogen motions in hydrogenated samples, respectively. NSE data, collected at Q-values corresponding to inter-chain correlations and at $T > T_g$, indicate an order of magnitude increase in the chain relaxation time in the SWNT composite relative to pure PMMA. BS data support this observation and show suppressed atomistic motions in the composite in the same temperature range. A peculiarly opposite trend, however, is observed below T_g, indicating that the presence of SWNTs promotes polymer mobility in the glassy state, in contrast with previous reports on PMMA/C60 composites which exhibit suppressed mobility at all temperatures below and above T_g.

Rana Ashkar
UMCP/NIST

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