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The Nano-mechanical Properties of Polystyrene Thin Films Embedded with Surface Grafted Multiwalled Carbon Nanotubes ARNOLD YANG, CHIH-CHUN HSIAO, TIAN SHYNG LIN, LING YU CHENG, CHEN-CHI MAR, National Tsing Hua University — Thin polystyrene (PS) films embedded with well-dispersed PS- grafted multi-walled carbon nanotubes (MWNTs) were successfully prepared via solution casting and the nano-mechanical behavior of the thin films was studied. Percolated network of entangled nanotubes was observed in the nanocomposite films, which resulted strikingly different mechanical properties as compared to the pristine PS films. The nanocomposite films developed crazes upon stretching and the crazes were very short and narrow with a width no more than 2μm. As the applied strain increased, the crazes increased in number but the widening of crazes was restricted, leading to a very tough mechanical behavior that showed no macroscopic voiding even at large strains beyond 20%. Significantly, no nanotubes were observed inside crazes from SEM or AFM of the plasma etched samples. Instead, they seemed to be excluded from crazes and were found accumulated at the craze boundaries. The observations indicated that craze initiations were largely confined to the defect regions where nanotubes were loose or sparse.

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