عنوان مقاله:

Synthesis and characterization of poly methyl methacrylate-b-polystyrene copolymer/ multi -walled carbon nanotubes via ATRP and NMRP techniques

محل انتشار:

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خلاصه مقاله:

Graft polymerization of polymethyl methacrylate–block-polystyrene (PMMA-b-PSt) has been carried out from the surface of multi-walled carbon nanotubes (MWCNTs) using living radical polymerization methods. For this purpose, the first surfaces of MWCNTs were functionalized by acid treatment and then acylated by thionyl chloride ($SOCl_2$). After that, the toluene unit was successfully grafted onto MWCNTs side walls by Friedel craft acylation reaction in the presence of ZnO as a catalyst. The obtained nanotube-toluene was brominated by N-bromosuccinimide (NBS). This brominated nanotube-toluene was used as a macroinitiator for atom transfer radical polymerization (ATRP) of methyl methacrylate (MMA) in the presence of the CuBr/ ۲, ۲ -bipyridine (bpy) catalyst system to obtain MWCNTs-graft-polymethyl methacrylate (MWCNTs-g-PMMA). Then ۱-hydroxy-۲, ۲, ۶, ۶-tetramethyl-piperidine (TEMPO-OH) obtained by reduction of ۲, ۲, ۶, ۶-tetramethyl-piperidinyl-۱-oxy (TEMPO) with sodium ascorbate. The bromine groups at the end of PMMA have converted to nitroxide mediated groups by coupling with TEMPO-OH to yield MWCNTs terminated with a TEMPO unit (MWCNTs-PMMA-TEMPO). At last, the resulting macroinitiator was employed for 'living' free-radical polymerization of styrene (St) by nitroxide-mediated radical polymerization (NMRP) to form MWCNTs-g-(PMMA-b-PS). Fourier transform infrared (FT-IR) spectroscopy, transmission electron microscopy (TEM), scanning electron microscopy (SEM), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA) show the effective grafting of MMA and styrene onto the MWCNTs.

کلمات کلیدی:

Multi-walled carbon nanotube functionalization, ATRP, Polystyrene, NMRP