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STATE OF DISPERSION OF MULTIWALL CARBON NANOTUBES IN MELT-MIXED CO-CONTINUOUS BLENDS OF POLYPROPYLENE/ACRYLONITRILE BUTADIENE STYRENE

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Blends of polypropylene (PP) and acrylonitrile butadiene styrene (ABS) with multiwall carbon nanotubes (p-MWNT) were prepared by melt-mixing in a conical twin-screw microcompounder in order to prepare conducting composites. These blends revealed significant refinement in morphology in presence of p-MWNT suggesting the 'compatibilization-like' action of p-MWNT. The electrical percolation threshold for co-continuous 45/55 PP/ABS blends was found between 0.4-0.5 wt % of p-MWNT. MWNT were observed to localize predominantly in PP phase of blends presumably due to lower melt viscosity of PP as compared to ABS. In order to overcome the strong inter-tube van der Walls forces of attraction, p-MWNT were modified with a novel modifier (sodium salt of 6-amino hexanoic acid, Na-AHA) and also with neutralized MWNT (n-MWNT). The dispersion of modified MWNT in aqueous solution was investigated through UV visible spectroscopy, dynamic light scattering experiments and transmission electron microscopic observations. Raman spectroscopic analysis suggested that debundling of MWNT is persistent even in solid mixtures of MWNT resulting in consistent decrease in the ratio of intensity of D band to G-band of Raman spectrum. The proposed mechanism of dispersion of MWNT in aqueous solution was based on the electrostatic charge repulsion between modified MWNT. The dispersion of modified MWNT was also investigated in 45/55 PP/ABS blends. Blends with Na-AHA modified MWNT revealed significant decrease in electrical percolation threshold (~ 0.1 wt %) in presence of Na-AHA (p-MWNT:Na-AHA : 1:15). Blends with mixtures of p-MWNT/n-MWNT revealed an increase in the electrical conductivity of blends (at 3 wt % MWNT content) and was found to be dependent on the concentration of n-MWNT in solid mixtures of p-MWNT/n-MWNT. Differential scanning calorimetric analysis and solution experiment indicated migration of MWNT towards the ABS phase of blends in presence of n-MWNT.