The influences of melt-compounding parameters on the tensile properties of low filler loading of untreated-MWCNTs polypropylene (PP) nanocomposites.

ABSTRACT

This study is to investigate the effects of addition self synthesised multi-walled carbon nanotubes (MWCNTs), to the final properties of polypropylene (PP) matrix nanocomposites. The influences of melt blending parameters were evaluated, where the interrelationship between the temperatures of compounding and roller rotor speed of sh earing blade parameter, to the tensile properties of fabricated composites were studied. MWCNT was synthesised in the laboratory scale; by using the floating catalyst chemical vapour deposition(FC-CVD) method. Pre-compounding work is begun with de-agglomeration of MWCNT which carried out by combining the ultrasonication and mechanical stirrer means simultaneously. Carbon nanotubes produced was first verified by using SEM and TEM imaging microscopy t echniques. It was later integrated with the thermoplastic PP matrix, via melt blending process through internally mixing approach. Very low weight percentage of chemically untreated MWCNT (0, 0.25, 0.50, 0.75 & 1.00 wt. %) was added into PP and later was compression moulded to the thin sheet of composites film. Composites were prepared by varying the compounding temperature into three processing temperature namely 165, 175 & 185°C and also into three shearing speed of roller rotor blade, 40, 60 & 80 rpm respectively. Later, it was mechanically tested via tensile testing following the ASTM D-638 standard method. The interrelationship between each parameter of compounding to the mechanical tensile properties was tested. It was shown that, the additional of very low loading of untreated-MWCNT filler content, does give moderate effects on reinforcement to the tensile properties of composite. Different compounding parameter gives significant difference to the pattern of plot which was comparable between each other.

Keyword: MWCNT; Polypropylene; FC-CVD; Melt blending; Low filler loading; Untreated; Compounding parameters.