MONASH University

DEPARTMENT OF MATERIALS ENGINEERING

Seminar

DISPERSION OF CARBON NANOTUBES IN POLYMER MATRIX

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3:00 p.m. – 4:00 p.m.
Science Lecture Theatre S9

On account of strong inter-tube van der Waals' forces between the carbon nanotubes, the formation of percolative 'network-like' structure is often hindered in polymer/MWNT (multiwall carbon nanotubes) composites manifesting in higher electrical percolation thresholds. To overcome this challenge we adopted a generic strategy to overcome the van der Waals' interactions between MWNT. This was achieved by utilizing reactive modifiers containing ionic moieties (viz. Na/Li salt of 6 amino hexanoic acids, Na salt of adipic acid etc.). These modifiers were able to establish specific interactions (viz. 'cation-π') with the extended delocalized 'π-electron clouds' of MWNT and eventually facilitate 'network-like' structure of MWNT in the matrix. In addition, the melt-interfacial reaction during melt mixing was found to restrict the MWNT in a given phase and subsequently improved the bulk electrical conductivity of the system (polyamide 6/MWNT composites). The existence of 'cation-π' interaction was also established in polyethylene based ionomer with carbon nanotubes composites as well. In order to understand the 3D 'network-like structure' formation and the specific interactions involving MWNT; AC electrical conductivity, melt rheology and various spectroscopic methods were utilized. The work has also been extended in binary polymer blends involving MWNT in connection with 'double percolation' phenomenon associated with co-continuous morphology. The level of percolation threshold and the state of dispersion of MWNT also strongly depend on the matrix polymer, filler-matrix interactions etc. To understand the parameters influencing the state of dispersion of the filler and the bulk electrical conductivity we studied various blends system involving MWNT viz. polyamide6/acrylonitrile-butadiene-styrene (PA6/ABS), polyamide6/ionomer (PA6/Surlyn), polypropylene/acrylonitrile-butadiene-styrene (PP/ABS) and polypropylene/engage (PP/Engage). Overall, structure-property relationship studies will be discussed in melt-mixed polymer/MWNT composites.

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