Preparation and properties of highly conductive HRG-PMMA nanocomposites by Solution blending and In-Situ polymerization method

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Graphene polymer nanocomposites have been in the focus of many investigations in the last few years due their exceptional thermal, mechanical and electrical properties. The present work reports the preparation and properties of Poly Methyl Methacrylate/Highly Reduced Graphene (PMMA/HRG) nanocomposites by *in-situ* and solution blending polymerization method. The *in-situ* polymerization was carried out at 70 ^{0}C for 24 hrs under N_2 atmosphere in the presence of monomer and initiator while in case of solution blending HRG sheets were blended with PMMA by stirring and sonication at 70^{0}C. The electrical conductivity measurement in case of *in-situ* polymerization shows lowest percolation threshold at lower filler loading which appeared at 0.25 wt% (0.08 S/m). However solution blending has 0.65 wt% (0.039 S/m). The highest conductivity of 34 S/m was achieved in case of *in-situ* which is much higher in comparison of solution blending (26 S/m at 2.5 wt %.). In both the methods, the glass transition temperature (T_g) values were found in the range of 112 ◦C to 118 ◦C with similar thermal stability and polymer-filler attraction.