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Morphology and crack toughness behaviour of PP-MWNT nanocomposites R. WEIDISCH, M. GANSS, B. K. SATAPATHY, Institute of Material Science and Technology, Friedrich Schiller University-Jena, Germany, P. POETSCHKE, D. JEHNICHEN, A. JANKE, Leibniz Institute of Polymer Research, Dresden, Germany — Morphology and crack toughness of PP-MWNT nanocomposites have been studied by AFM-WAXD and essential work of fracture approach respectively. A ductile-to-semiductile transition in the crack resistance behaviour of PP-MWNT nanocomposites and its interrelation to the structural attributes studied by SEM and DSC has been discussed. A maximum in the non-essential work of fracture was observed at 0.5 wt.-% MWNT demonstrating enhanced toughness compared to pure PP, followed by a sharp decline as the MWNT content was increased to 1.5 wt.-% reveals a ductile-to-semiductile transition. Fracture kinetics studies presents a qualitative picture of the nature of such a transition in terms of (a) switch over from non-steady (in pure PP) to steady state crack-tip-opening-displacement rate (in nanocomposites) and (b) ductile-to-semiductile transition being largely due to delayed-yielding in the nanocomposites . The time-resolved analysis of strain field offering insight into the crack propagation kinetics has revealed that such a transition is caused by rapid development of critical local stresses causing a shift of crack initiation to shorter time, resulting in a semi-ductile fracture of nanocomposites containing 1.5 wt.% MWNT.

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