

## Characterization of Microinjection Moulded Composites of Polyamide 6 and Carbon Nanotubes

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Microinjection molding is a powerful technology in micro-manufacture, providing millimeter scale parts at large scale production rate. In order to produce homogeneous composite parts, good dispersion of the nanoreinforcement in the polymer matrix is required. In the present work the carbon nanotube (CNT) reinforcement was dispersed in polyamide 6 (PA6) using a mini twin-screw extruder. Nanocomposites were prepared with different compositions (1% and 4,5%) of pure CNT (p-CNT) and functionalized CNT (f-CNT).<sup>1</sup>

The effect of CNT functionalization on the PA6/CNT interface, the CNT dispersion, the nanocomposite morphology and structure, for the microinjection moulded parts, were studied by optical and electron microscopies, differential scanning calorimetry and X-ray diffraction.

It was observed that CNT functionalization improved dispersion, showing the formation of a larger number of smaller agglomerates as compared to the p-CNT composites. The incorporation of CNT increased the electrical conductivity of the microinjection molded composites, and, at low CNT loading, f-CNT improved mechanical properties relative to p-CNT. DSC and X-ray analysis showed that the total crystallinity of the PA6 was marginally affected by the presence of CNTs, but a large change in the relative amount of  $\alpha$  and  $\gamma$  crystalline forms of the PA6 was observed from pure polymer to the nanocomposites, as depicted in Figure 1.

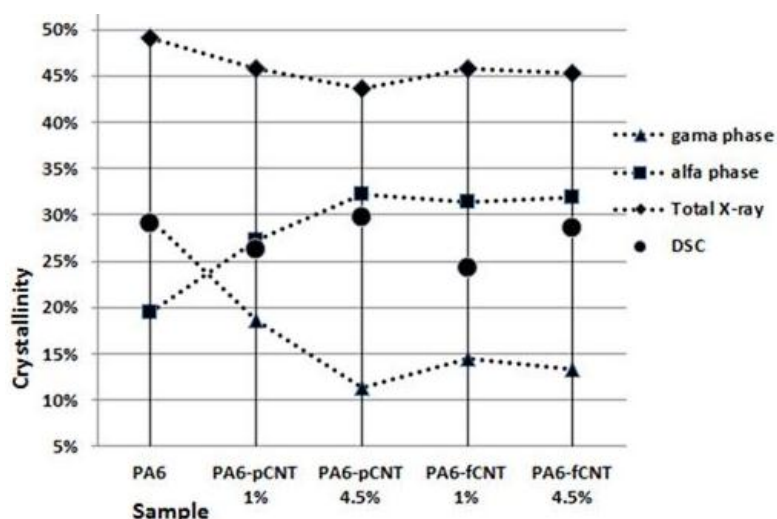


Figure 1: Variation of  $\alpha$  and  $\gamma$  crystalline forms of PA6 for the microinjection moulded parts of the polymer and its nanocomposites.

### References

<sup>1</sup> M.C. Paiva, F. Simon, R. Novais, T. Ferreira, M.F. Proença, W. Xu, et al. ASC Nano, 4, 12, 7379 (2010).