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Title:

Dispersion and re-aggregation phenomena in carbon nanotube polymer composites

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Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

The preparation of polymer nanocomposites is usually carried out in twin-screw extruders or internal batch mixers. Previous studies have extensively shown that the resulting filler dispersion is strongly dependent on the characteristics of the melt mixing equipment [1,2]. It is also known that the dispersion level of nanofillers strongly affects the final nanocomposite properties [3,4].
The present work focuses on the study of the dispersion of carbon nanotubes (CNT) in polypropylene using a prototype mixer that develop high thermomechanical stress. The distribution and dispersion of the CNT was evaluated by optical and electron microscopy. The level of dispersion achieved was analysed, and the electrical resistivity of the composite, along the mixing cycles, was measured.
The enhancement of the CNT dispersion along the mixing process correlated with a large decrease in electrical resistivity of the composite. A "percolation time", defined as the time, or number of mixing cycles, required to achieve electrical conductivity, was measured, and correlated with mixing conditions. The composite formed was re-heated and reprocessed using the same mixing system. Re-agglomeration and loss of electrical conductivity was observed, and the final dispersion level varied with the mixing conditions imposed. Agglomerate size and electrical resistivity increased when reprocessing was performed at lower shear rate, as compared to the first processing cycle.

References

1. Lin, B.; U. Sundararaj; Petra Pötschke. 2006. Macromolecular Materials and Engineering, 291, 227-238.
2. Maric, M. and C. Macosko. 2001. Polymer Engineering and Science, 41,1.
3. Pegel, S.; P. Pötschke; G. Petzold; I. Alig; S. M. Dudkin; D. Lellinger. 2008. Polymer, 49, 974.
4. Haggenmueller, R.; H. Gommans; A. Rinzler; J. Fischer; K. Winey. 2000. Chemical Physics Letters, 330, 219-225.