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A COMPARATIVE STUDY OF THE DISPERSION OF CARBON NANOFIBRES IN POLYMER MELTS

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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]. In turn, the dispersion level of nanofillers may strongly affect the final nanocomposite properties [3,4].
The present work focuses on the study of the dispersion of carbon nanofibres (CNF) and nanotubes (CNT) in polymers using two melt mixing methods that develop distinct thermomechanical stresses (mini-twin screw extruder, prototype mixer with strong extensional flow component). The distribution and dispersion of the nano-reinforcement was evaluated by optical and electron microscopy. The CNF were chemically modified to improve the interface with the polymer matrix. The level of dispersion achieved with as-received and chemically functionalized CNF was analyzed.
The results showed that the two methods produced good distribution of the CNT and CNF, but the device with a strong extensional flow component produced better dispersion. This improved dispersion correlated with a large decrease in electrical resistivity in the case of the CNT composite. The chemical modification of the CNF largely improved the CNF/polymer interface.

References

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