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A Comparison of Kinetic and Mechanical Properties between Graphene Oxide (GO) and Carbon Nanotubes (CNT)-Epoxy Nanocomposites

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Abstract : It is still unknown how the presence of nanoparticles such as graphene oxide (GO) or carbon nanotubes (CNT) influence the curing process and the final mechanical properties as well. In this work, kinetic and mechanical properties of the nanocomposites were analyzed, where the kinetic process was followed by DSC and the mechanical properties by DMA as well as mechanical tests. Initially, CNT was annealed at high temperature (1800 °C) under vacuum atmosphere, followed by a chemical treatment using acids and ethylenediamine. GO was synthesized through chemical route, washed clean, dried and ground to #200. The presence of functional groups on CNT and GO surface was confirmed by XPS spectra and FT-IR. Then, nanoparticles and acetone were mixed by sonication in order to obtain the composites. DSC analyses were performed on samples with different curing cycles (1h 80 °C + 2h 120 °C; 3h 80 °C + 2h 120 °C; 5h 80 °C) and samples with different times at constant temperature (120 °C). Mechanical tests were performed according to ASTM D638 and D790. Results showed that the kinetic process and the mechanical strength are very dependent on the presence of graphene and functionalized-CNT in the nanocomposites, and the GO reinforced samples had a slightly bigger improvement compared to functionalized CNT.

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