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Influence of the chemical functionalization of graphene on the properties of polypropylene-based nanocomposites

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ABSTRACT

Nanocomposites of polypropylene were prepared with different loadings of both commercially-available graphene and graphene that had been modified with low molecular weight polypropylene brushes. The dependence of the thermal stability, electrical conductivity and mechanical properties of the composites on the type and loading of the graphene filler have been investigated. The mechanical properties were studied using several techniques, including nanoindentation, four-point bending coupled to Raman spectroscopy and tensile testing. Significant differences on the mechanical performance, due to the influence of graphene content and modification, have been observed; i.e. the Young's modulus takes values up to 30% higher for nanocomposites with modified graphene, compared to those with pristine graphene. Different trends on the variation of mechanical properties have been encountered at the local and macro scales and a discussion of the respective results from the different techniques is offered. Finally, the behavioral changes on the electrical conductivity are also discussed.

KEYWORDS: Polymer-graphene composites; polyolefin; mechanical properties; electrical properties.

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