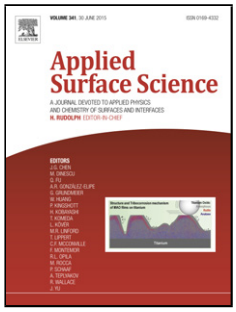

Title: Preparation of amino-functionalized graphene oxide/polyimide composite films with improved mechanical, thermal and hydrophobic properties

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Preparation of amino-functionalized graphene oxide/polyimide composite films with improved mechanical, thermal and hydrophobic properties

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1. GO functionalized with p-phenylenediamine (PDA) exhibits good dispersibility and compatibility with the polymer matrix.
2. Covalent incorporation of GO-NH_2 into polyimide via *in situ* polymerization and thermal imidization.
3. Significant reinforcement on the mechanical properties, hydrophobic behavior and thermal stability of the PI/ GO-NH_2 nanocomposites.

Abstract

This study proposes a new approach to prepare polyimide (PI)-based nanocomposites containing amino groups functionalized graphene oxide (GO-NH_2) via *in situ* polymerization and thermal imidization. GO-NH_2 nanosheets which exhibit excellent dispersibility and compatibility with the PI matrix were successfully obtained through the chemical reaction between graphene oxide (GO) and p-phenylenediamine (PDA). The mechanical properties, thermal stability and hydrophobic behavior of the PI/GO-NH_2 composites were significantly improved compared with those of pure PI because of excellent dispersion of GO-NH_2 and the strong interfacial covalent bonds between GO-NH_2 and the PI matrix. With a 3wt% GO-NH_2 loading, the tensile modulus of PI/GO-NH_2 nanocomposites was increased from 1930 MPa to 3139 MPa, and the tensile strength was increased from 101.5 MPa to 156.8 MPa, which were approximately 63 % and 54.5 % enhancement compared to the pure PI, respectively. The 10% weight loss temperature of PI/3wt% GO-NH_2 is improved 24°C compared with neat PI film (539.5°C). Furthermore, the hydrophobic behavior of the composite films is greatly improved. This effective approach provides a strategy for developing high-performance and multifunctional polymer-based composite materials.

Keywords