Functionalisation of boron nitride nanosheets

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Boron nitride has been recognised as a suitable thermal filler and is therefore a preferable candidate for the fabrication of thermally conductive and electrically insulating polymers. However, unlike conventional filled polymers, those filled with 2D nanomaterials require less amount of nanofiller to bring about significant changes in properties [1-3], hence making boron nitride nanosheets (BNNSs) superior to their bulk counterpart *h*-BN, and highly attractive for this application. Nonetheless, the poor interface miscibility of BNNSs and polymers is still a challenge [4]. The aggregation of BNNSs and the poor interaction with the polymer matrix greatly hinder the thermal conductivity enhancement [5-9]. In order to reduce the agglomeration and accumulation of the nanosheets and improve their distribution within polymers, BNNSs can be chemically modified [10]. The BNNSs were functionalised with three different coupling agents: (3-aminopropyl)dimethylmethoxysilane, (3-aminopropyl)diethoxymethylsilane, and (3-aminopropyl)trimethoxysilane. Although all three silanes were successfully covalently bound to the boron nitride nanosheets, as determined by FT-IR, zeta potential, WAXS and EDX measurements, the number of reactive alkoxy groups had an influence on the reaction. The more alkoxy groups, the more difficult the functionalisation appeared to be, due to the polymerisation of the silanes into siloxane networks. FT-IR, DLS, SAXS, WAXS and SEM results demonstrated clearly the effect that the number of alkoxy groups had on the functionalisation of the boron nitride nanosheets.

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