Large – scale production and organo functionalization of boron nitride nanosheets and their characterization

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Boron nitride nanosheets (BNNS) have gained great attention as an interesting filler medium in the production of electrically insulating and thermally conductive polymer-based composite materials. Their wide band gap and high thermal conductivity make BNNS a superior candidate for this application. However, one of the greatest barricades to the further investigation and production of these polymers is the lack of cost-effective methods for fabricating high yields of BNNS. Furthermore, using these nanosheets as fillers can be challenging due to their high tendency to aggregate. The production of boron nitride nanosheets by using the liquid phase exfoliation method (LPE) was investigated and ways to increase the yield and upscale the production are demonstrated. Moreover, the BNNS were functionalized with organo silanes, so that the modified nanosheets can bond covalently to the polymer matrix, leading to the prevention of aggregation and an increased thermal conductivity of the polymer. The boron nitride nanosheets were characterized by dynamic light scattering (DLS), small angle x-ray scattering (SAXS), transmission electron microscopy (TEM), infrared spectroscopy (IR) and ultraviolet-visible spectroscopy (UV-VIS).