Composites prepared by thermal reduction of graphene oxide in polyamide 6 matrix

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Graphene oxide (GO) is an easy scalable material and it offers an elegant route for producing functionalized materials via oxygen functional groups and graphene derived materials. GO was synthesized from graphite powders with particle size around 50 and 300 μm, using improved Hummers' method.[1] The obtained GO flakes, are approximately in the same size range as the used graphite (Figure 1) and have high amount of oxygen functional groups.
The GO decomposition was followed by TGA, in a nitrogen atmosphere, with a heating rate of 2 °C/min. Decomposition proceeds in few, not well separated steps. The fastest decomposition is in a temperature range of 150-200 °C. The majority of GO decomposes at the temperatures up to 280 °C, although slow decomposition proceed up to at least 1000 °C.

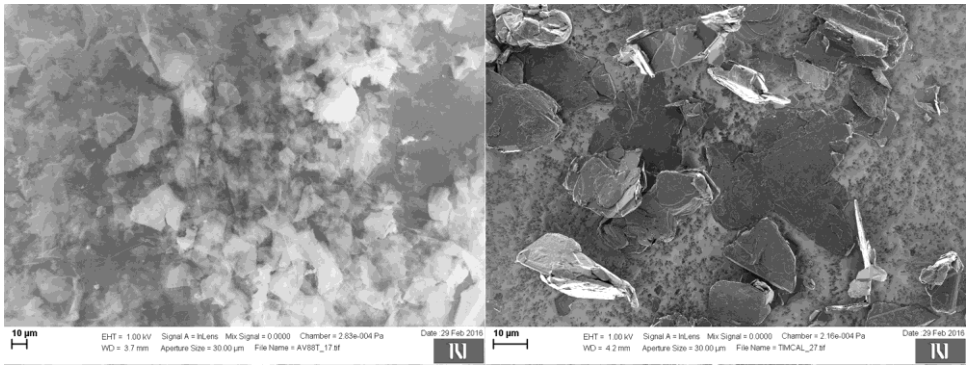

Figure 1: SEM micrograph of graphene oxide (left) and graphite (right).

The GO and Polyamide 6 (PA6) composites were prepared in ratio of 1:9. Reduction of GO to thermally reduced GO (TrGO) was performed in Haake™ Minilab microcompounder. Various temperatures and reaction times were used. The composites were directly transferred to MiniJet Pro injection moulding machine where samples for dynamic mechanical analysis (DMA) were prepared.
Thermal properties of all composites were determined by differential dynamic calorimeter (DSC), viscoelastic properties by DMA, and the changes of GO were followed by XRD.

References

[1] D.C. Marcano et al., ACS Nano **4**, 4806, (2010).

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