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Can ε-caprolactone improve dispersibility and interfacial adhesion of graphene oxide in polyamide-based nanocomposites?

Jaroslav Minar and **Jiri Brozek**
University of Chemistry and Technology, Czech Republic

Presence of nanofillers in a polymer matrix can significantly improve properties of resultant nanocomposites. To achieve such improvement, a homogenous dispersion of nanofiller in matrix and strong interfacial adhesion between them are prerequisites. In this presentation, I want to introduce our approaches to enhance these parameters for *in situ* intercalative polymerization of ε-caprolactam/graphene oxide dispersion to yield polyamide-based nanocomposites. In first procedure, an improvement was achieved by addition of ε-caprolactone to mentioned dispersion followed by anionically initiated polymerization. As a result of improved dispersibility, tensile modulus increased with higher nanofiller concentration. The second procedure consisted in utilization of graphene oxide functionalized by poly(ε-caprolactone). Functionalization was carried out by polymerization of ε-caprolactone initiated by graphene oxide functional groups that resulted in partial covalent attachment of poly(ε-caprolactone) chains to graphene oxide. Polyamide 6 nanocomposites containing functionalized graphene oxide showed higher dynamic modulus and higher exfoliation level than nanocomposites with an initial graphene oxide. As presence of ε-caprolactone/poly(ε-caprolactone) proved to be effective for achieving better dispersibility and interfacial adhesion, I also want to outline one-pot method for covalent functionalization of graphene oxide. This method consists in ε-caprolactone polymerization in dimethylformamide/graphene oxide dispersion directly followed by Steglich esterification to introduce covalent bonds between poly(ε-caprolactone) and graphene oxide.

Biography

Jaroslav Minar completed his master studies at the age of 25 years from University of Chemistry and Technology, Prague, where he continues in his doctoral studies under supervision of Professor Jiri Brozek. His fields of interests are polymer nanocomposites based on graphene oxide. He works for an industrial research company, where he focuses on a pyrolysis of a plastic waste.

minarj@vscht.cz

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