INVITED LECTURE – CHRISTOPHER MACOSKO

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# Morphology and Properties of Exfoliated Graphene/Thermoplastic Nanocomposites

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Graphite has attracted large attention as a reinforcement for polymers due to its ability to modify electrical conductivity, mechanical and gas barrier properties of host polymers and its potentially lower cost than carbon nanotubes. If graphite can be exfoliated into atomically thin graphene sheets, it is possible to achieve the highest property enhancements at the lowest loading. However, small spacing and strong van der Waals forces between graphene layers make exfoliation of graphite via conventional composite manufacturing strategies challenging. Recently, two different approaches to obtain exfoliated graphite prior to blending were reported: thermal treatment (FGS) (Schniepp et al., 2006) and chemical modification (iGO) (Stankovich et al., 2006) of graphite oxide. We describe and evaluate these exfoliation approaches and the methods used to produce graphene reinforced thermoplastics, particularly polyester, polycarbonate, polyethylene and polyurethane (TPU) nanocomposites. Three different dispersion methods - melt blending, solution mixing and in-situ polymerization – are compared. Characterization of dispersion quality is illustrated with TEM, rheology and in electrical conductivity, tensile modulus and gas barrier property improvements.

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