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Nanoscale friction of graphene oxide over glass-fibre and polystyrene

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Abstract

Coatings of graphene oxide over two substrates of glass-fibre and polystyrene were obtained by electrophoretic deposition (EPD). A chemical reduction of graphene oxide by exposure to hydrazine hydrate at 100°C significantly changes the interfacial interaction with the substrate as well as the tribology. Spectroscopic techniques like Fourier transform infrared, Raman spectroscopy, X-ray photoelectron spectroscopy and X-ray diffraction showed that the treatment with hydrazine replaces oxygen functional groups and also induces roughness, a structural disorder and decreases the interlayer separation in the transition from graphene oxide (GO) to reduced graphene oxide (rGO). Treatment with hydrazine reduces adhesion and friction force against diamond like carbon coated Si probe (DLC AFM) at the basal plain of the coatings. Investigation at the edges revealed that the presence of oxygenic functional group leads to higher shear strength with glass-fibre and polystyrene which reduces after treatment with hydrazine.

Keywords: Adhesion, Glass fibers, Wear, Thin films