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Surface morphology and nanofriction of thermally treated multilayer graphene

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ABOUT

Abstract

Correlation of surface morphology alteration in affecting the nanotribological properties of multilayer graphene (Gr) film has been rarely reported in the literature. Thus, the study determines the extent of surface morphology alteration influencing the friction of multilayer Gr film. The multilayer Gr film was treated at 200°C and 400°C using a one-zone tube furnace under vacuum. At 400°C, the film area roughness was reduced by 53% (Sa). Through Raman analysis, the reduced roughness is attributed to mechanical (tensile) strain. Concurrently, the coefficient of friction dropped from 0.14 to 0.05 (64% reduction), inferring that the multilayer Gr film friction can be modified using thermal treatment. This treated sample also exhibited improved electrical conductivity (33% sheet resistance reduction) due to electron doping. The improved conductivity with lower nanofriction of the treated multilayer Gr film is favourable for sliding electrical contact interfaces, imperative in enhancing the broad adoption of Gr in MEMS/NEMS.

Keywords

graphene, surface morphology, nanofriction, raman spectroscopy, thermal treatment

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