

Graphene nanoplatelets–cellulose nanocrystals in engine oil for automotive applications

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ABSTRACT

The friction and wear of worn surfaces is a principal cause of energy dissipation in automobile engines. The current study investigates graphene nanoplatelets (GNPs), based on a carbon allotrope, that have good thermal, physical and chemical properties, and cellulose nanocrystals (CNCs) as a universal nano-sized ecological biopolymer. In view of this, the objective of the present work is to enhance the tribological behavior and lubricant properties using hybrid GNPs and CNCs blended with SAE 40 engine oil with various concentrations in the range 0.01–0.10%. The characterization was carried out by using different techniques such as X-ray diffraction (XRD) and field emission scanning electron microscopy (FESEM). The XRD patterns confirmed the platelet structure of GNPs, and FESEM showed that the sizes of small and agglomerated particles were 20–50 and 200 nm for GNPs and CNCs, respectively. Scanning electron microscopy morphological evaluation was conducted for all volumetric concentrations of single and hybrid nanolubricants. Morphological investigation indicated that there is homogeneous dispersion and there is a smoother surface after using graphene:CNC nanolubricants compared with that using just SAE 40.

KEYWORDS: CNC/GNPs/lubricants/SAE 40/thermal conductivity/viscosity

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