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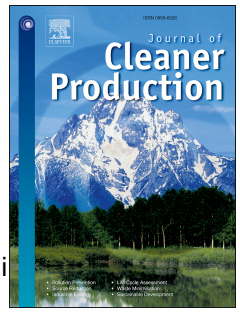

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Physical properties optimization of POME-groundnut-naphthenic based graphene nanolubricant using response surface methodology

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Abstract

In this research, different oil blends were produced by mixing naphthenic base oil, groundnut oil, palm oil methyl ester and nanometer thick graphene flakes. The thermophysical properties such as viscosity, thermal conductivity, volatility and suspension stabilities were measured and modeled for each oil and blends. Every individual parameter was modeled following quadratic multiple linear regression analysis and optimized using the desirability approach. The behavior of each selected property as a function of groundnut oil, palm oil methyl ester and graphene concentrations are discussed and consequently optimized to select the best combination of constituents. While groundnut oil, palm oil methyl ester and graphene were used as additives, had various effects independently on the property of naphthenic base oil. The first noteworthy observation is that the blends made with the higher composition of groundnut oil resulted in higher viscosity index, thermal conductivity, nanosuspension stability, and reduced volatility. Secondly, the viscosity index and thermal conductivity of graphene-based groundnut oil compared to pure naphthenic oil enhanced by 49% and 38% respectively. On the other hand, its