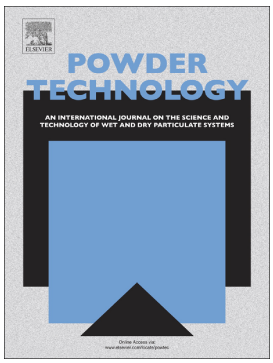

Effects of graphene oxide'silicon oxide hybrid nanomaterials on rheological behavior of water at various time durations and temperatures: Synthesis, preparation and stability

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Effects of graphene oxide-silicon oxide hybrid nanomaterials on rheological behavior of water at various time durations and temperatures: Synthesis, preparation and stability

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Abstract

The present empirical study investigates the synthesis of graphene oxide nanoparticles, preparation of water/graphene oxide-silicon oxide hybrid nanofluid, and parameters affecting viscosity of the nanofluid. Graphene oxide nanoparticles are synthesized using the modified Hummer's method. Surface structure and atomic structure of the nanoparticles were studied using SEM and XRD tests. The nanofluid was then prepared using the two step method. DLS tests with various patterns were used, in addition to sedimentation photograph capturing method, to measure stability of the nanofluid. Results suggested that the nanofluid has a fairly suitable nanostructure. Viscosity of the nanofluid was measured and studied using Brookfield DV2EXTRA-Pro Viscometer, in the temperature range of 20-26°C with volume concentrations of 0, 0.5, 0.1, 0.2, 0.4, 0.6, 0.8, and 1%. Furthermore, effects of parameters such as shear rate, and period of applying constant shear rate on viscosity of the nanofluid were investigated. The test results showed that viscosity behavior of the nanofluid is independent of the shear rate and time of shearing. Numerical viscosity measurement results show that viscosity of the nanofluid with volume concentration of φ=1%, in temperature of 20°C, increased considerably to μ=2.42mPa.s. Viscosity changes ratio increases intensively in higher concentrations. Comparing empirical results of water/graphene oxide nanofluid viscosity to