

Water-in-Diesel Fuel Nanoemulsions Prepared by Modified Low Energy: Emulsion Drop Size and Stability, Physical Properties, and Emission Characteristics

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Abstract : This paper studies the physical and rheological behaviours of water/in/diesel fuel nanoemulsions prepared by modified low energy method. Twenty of water/in/diesel fuel nanoemulsions were prepared using mixed nonionic surfactants of sorbitan monooleate and polyoxyethylene sorbitan trioleate (MTS) at Hydrophilic-Lipophilic Balance (HLB) value of 10 and a working temperature of 20°C. The influence of the prepared nanoemulsions on the physical properties such as kinematic viscosity, density, and calorific value was studied. Also, nanoemulsion systems were subjected to rheological evaluation. The effect of water loading percentage (5, 6, 7, 8, 9 and 10 wt.%) on rheology was assessed at temperatures range from 20 to 60°C with temperature interval of 10 for time lapse 0, 1, 2 and 3 months, respectively. Results show that all of the sets nanoemulsions exhibited a Newtonian flow character of low-shear viscosity in the range of 132 up to 191 1/s, and followed by a shear-thinning region with yield value (Non-Newtonian behaviour) at high shear rate for all water ratios (5 to 10 wt.%) and at all test temperatures (20 to 60°C) for time ageing up to 3 months. Also, the viscosity/temperature relationship of all nanoemulsions fitted well Arrhenius equation with high correlation coefficients that ascertain their Newtonian behavior.

Keywords : alternative fuel, nanoemulsion, surfactant, diesel fuel

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