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Mechanical and Thermal Characterization of Paraffin-Based Hybrid Rocket Fuels 2024-01-5261

This paper presents thermal properties and mechanical strength of hybrid rocket fuels with the base material of paraffin wax. The mechanical strength includes breaking point strain, modulus of elasticity and tensile strength at ultimate point for three different variant of paraffin-based formulations were examined and results were compared with pure paraffin fuels. The results indicate that the tensile strength and elastic modulus of paraffin-Al fuel having Al 5 wt % were increased by 32.2%, and 14.1% respectively compared to those of pure paraffin. The average tensile strength and elastic modulus of paraffin-CB (0.5 to 1.5 wt%) fuel were increased by 29.5%, and 16.3% compared to pure paraffin, respectively. Thermal properties were derived from were carried out with Differential Scanning Calorimetry (DSC) to explore the endothermic and exothermic reactions of samples with paraffin-based fuels. The values of heat of fusion calculated from the area under endothermic reaction were found about 120J/g and 126J/g for the paraffin and paraffin/polyethylene sample, respectively.

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