

## **Assessment of Variability in the Thermophysical Properties of Rocket Propellant RP-1**

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RP-1 has been widely used as the kerosene component of rocket propulsion systems since its development in the 1950s. Although RP-1 has been extensively studied over the years, questions remain concerning how compositional variability may affect the thermophysical properties of the fuel. In an effort to address these questions, density, speed of sound, and viscosity have been measured for eleven orthogonal blends of the rocket propellant RP-1. Density and speed of sound were measured over the temperature range of 278 K to 343 K, while viscosity was measured from 263 K to 373 K. All measurements were made at atmospheric pressure ( $\sim 83$  kPa). Varying, yet significant, degrees of variability over the eleven RP-1 samples were observed for all reported properties. The largest variability was observed for viscosity. The measurement data were also compared to previously reported results for a twelfth RP-1 sample and to the predictions of an existing surrogate mixture model. Discrepancies were observed that seem to indicate a need for the development of a more general model to capture the whole range of thermophysical property variability that is possible with the RP-1 fuel.