

Measurement of Jet Fuel and Fuel Surrogate Thermal Properties Using Thermogravimetric Analysis/Differential Scanning Calorimetry

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The combustion behavior of a fuel is affected by its heat capacity and heat of vaporization. This study utilized differential scanning calorimetry (DSC) to measure the heat capacity of jet fuel and model mixture systems (fuel surrogates). It also used a simultaneous DSC/thermogravimetric analysis (TGA) system to quantify the energy needed to evaporate the fuels and fuel surrogates. These surrogates contained various combinations of *n*-butylbenzene (aromatic compound), *n*-butylcyclohexane (cycloalkane), *n*-dodecane (linear alkane), and 2,2,4,4,6,8,8-heptamethylnonane (branched alkane). The surrogate fuel compositions were selected based on physical and combustion properties of the mixtures. The presentation will discuss the development of the experimental methods for quantifying evaporation behavior from initial failed isothermal experiments to systematic temperature ramping experiments. Estimates of heats of vaporization based on heat capacity and energy to evaporate will be compared to several published correlations. The optimal surrogate tested will be shown to have similar thermal properties to the jet fuel.