

Measurement of the Properties of Modern Lubricants: Base Fluids and Mixtures

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Modern high performance aircraft commonly use the fuel as not only a propellant, but also a heat transfer fluid, hydraulic fluid and even a lubricant. Indeed, in the near future, lubricating subsystems will be completely eliminated from high performance aircraft. Thus, the fuel will be expected to fulfill the lubricant role flawlessly. To enable this transition, we are measuring a suite of properties for lubricant base fluids and mixtures, with the goal of defining the molecular characteristics of lubrication. In this talk the first series of measurements will be presented. This will include the chemical characterization and thermal decomposition kinetics for a series of polyolester lubricant base fluids, as well as one fully qualified formulation that incorporates all additives. The chemical characterization was done by gas chromatography coupled with mass spectrometry, tandem mass spectrometry, and flame ionization detection. The thermal decomposition kinetics were measured by the ampoule reactor method introduced at NIST for complex fluids.