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STUDIES OF THE KINETICS OF JET FUEL THERMAL STABILITY BY LASER INDUCED FLUORESCENCE

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Thermal stability is a characteristic that relates to a fuel's ability to resist the formation of deposits when passed over a heated surface. This is an important fuel property because the fuel is used to cool the engine oil as well as electronics, and any deposit would reduce heat transfer efficiency. Additionally the fuel must pass through the fuel nozzle without leaving deposits that would increase the pressure drop or partially block the exit orifice; such deposits could then lead to hot streaks, non-uniform temperature profiles, and/or ignition difficulties. Thermal stability is becoming a greater issue with modern military and civilian aircraft engines as the cycle temperatures increase to achieve greater efficiency.

Thermal stability is not measured as a fuel property; it is evaluated secondarily as the color, weight, or thickness of deposit left on a heated tube in a deposition test. This deposit is not a property of the fuel. It is an artifact of the deposition test, i.e., the flow rate, temperature, and thermal history of the fuel. The authors contend that thermal stability, as a fuel property, is the formation rate of the precursors to these deposits. It is the variables of the flow system that then determine the deposition rate.

This paper summarizes the results of experiments using laser-induced fluorescence to study the kinetics of the formation of deposit precursors.