Alternative jet fuels will be important in the future to ensure cleaner burning, reliable air transportation. One important property that must meet certification standards is the fuel’s thermal stability, or its ability to withstand heating before breaking down. Jet fuels are used as engine coolants, and thermally unstable fuels can form deposits in the fuel delivery systems, leading to a loss of fuel flow.

In the past, the thermal stability of a fuel was rated using a color standard method. The color of deposits left on a metal tube that had been heated and exposed to the test fuel were matched with a color standard to rate the level of deposition, and thus the fuel’s thermal stability. Ellipsometry, which is an optical technique using changes in light polarization after it reflects off a sample to determine the thickness of any film on that sample, has recently been implemented to improve the measurement standards.

Various aspects of ellipsometry have been investigated in this work. In addition, several thermal stability studies were carried out. The effect of increasing temperature on the thermal stability of Sasol Iso-Paraffinic Kerosene, Jet A, JP-8 and Gevo jet fuel have been analyzed, and the effect of varying levels of the additive naphthalene in Sasol IPK has also been investigated. Various theoretical optical models have been evaluated for their ability to predict deposit thickness. Finally, scanning electron microscopy, ellipsometric tube rating, interferometric tube rating, and reference tubes have been used to validate these measurements.

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Approved for distribution by Subith Vasu, Committee Chair, on June 6, 2017.

The public is welcome to attend.