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Transport of Ablation Products in a Mach 5 Boundary Layer using Naphthalene PLIF CLEMENS NOEL, BRYAN LOCHMAN, ZACH MURPHREE, VENKAT NARAYANASWAMY, The University of Texas at Austin, Austin, TX — Planar laser-induced fluorescence of sublimated naphthalene was used to visualize the transport of ablation products in a Mach 5 turbulent boundary layer. The naphthalene was molded into a rectangular insert that was mounted flush with the floor of a Mach 5 wind tunnel. The naphthalene fluorescence was excited using a frequency quadrupled Nd:YAG laser (266 nm) and the fluorescence emission between 310 – 350 nm was collected. The temperature and pressure dependences of the fluorescence were studied in detail. An increase in the fluorescence was observed with increasing temperature for the temperature range tested (300 – 525K). Fluorescence-lifetime measurements were made in pure-air and nitrogen environments at 300 K over the range 3.3-101.3 kPa. The results in air exhibited the expected Stern-Volmer behavior with decreasing lifetimes at increasing pressure, whereas nitrogen exhibited the opposite trend. Preliminary PLIF images of the sublimated naphthalene were acquired in the Mach 5 turbulent boundary layer. Relatively low signal-to-noise-ratio images were obtained at a stagnation temperature of 345 K, but much higher signal images were obtained at a stagnation temperature of 375 K.

Clemens Noel

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