Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Development of Naphthalene PLIF for Making Quantitative Measurements of Ablation Products Transport in Supersonic Flows[1]
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— Ablation is a multi-physics process involving heat and mass transfer and codes aiming to predict ablation are in need of experimental data pertaining to the turbulent transport of ablation products for validation. Low-temperature sublimating ablators such as naphthalene can be used to create a limited physics problem and simulate ablation at relatively low temperature conditions. At The University of Texas at Austin, a technique is being developed that uses planar laser-induced fluorescence (PLIF) of naphthalene to visualize the transport of ablation products in a supersonic flow. In the current work, naphthalene PLIF will be used to make quantitative measurements of the concentration of ablation products in a Mach 5 turbulent boundary layer. For this technique to be used for quantitative research in supersonic wind tunnel facilities, the fluorescence properties of naphthalene must first be investigated over a wide range of state conditions and excitation wavelengths. The resulting calibration of naphthalene fluorescence will be applied to the PLIF images of ablation from a boundary layer plug, yielding 2-D fields of naphthalene mole fraction. These images may help provide data necessary to validate computational models of ablative thermal protection systems for reentry vehicles.

[1]Work supported by NASA Space Technology Research Fellowship Program under grant NNX11AN55H

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Date submitted: 01 Aug 2014 Electronic form version 1.4