THE DESIGN, CONSTRUCTION, AND OPERATION OF A PYROLYSIS NOZZLE IN A SUPERSONIC FREE-JET EXPANSION

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Pulsed pyrolysis nozzles can be used to perform free-jet spectroscopy on radicals. A pyrolysis nozzle produces radicals by molecular dissociation using high temperatures of 1000 to 2000 K. The pyrolysis nozzle needs to be constructed out of high temperature materials, be easily machineable, have an adjustable heating area, have a water-cooled heat sink, and function inside a vacuum chamber. Our nozzle design has been tested under vacuum and was heated resistively to 1500 K, as monitored with an optical pyrometer and a type C thermocouple. The nozzle is being characterized using ethylene as a precursor to produce vinyl radical. Fluorescence excitation and dispersed fluorescence spectra of the vinyl radical are planned.