Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Construction and Characterization of a Shock Tube for Ignition and Pollutant Formation Studies CORY PRYKULL, ROBERT DREIKER, Department of Mechanical and Aerospace Engineering, Syracuse University, MARCOS FERNANDES, Fundacao Educacional Inaciana, Sao Bernardo do Campo, Brazil, MAZEN ELDEEB, BEN AKIH-KUMGEH, Department of Mechanical and Aerospace Engineering, Syracuse University — Shock tubes are versatile research facilities with wide applications in aerodynamics, high-temperature chemical kinetics and medical research. We discuss the construction and the gas dynamics characterization of such a facility for combustion studies with a focus on ignition and pollutant formation. Measures to achieve high quality post-reflected shock conditions with minimal shock-boundary layer interactions are discussed. Characterization of the facility is first carried out using non-reactive gases in order to assess the quality of the post-reflected shock conditions and the available test times. The incident velocity is determined using fast response pressure transducers. Experimentally observed post-reflected shock pressure profiles are compared with predictions of one dimensional shock equations, which also allow for the calculation of temperature. Subsequent shock tube ignition experiments are carried out for selected fuel and oxidizer systems from the literature in order to validate and thereby, demonstrate the suitability of the facility for combustion studies. Further measurements of soot volume fractions under fuel rich conditions are realized by means of laser extinction.

Cory Prykull
Department of Mechanical and Aerospace Engineering, Syracuse University

Date submitted: 02 Aug 2013 Electronic form version 1.4