Abstract Submitted
for the GEC08 Meeting of
The American Physical Society

Breakdown Behavior in Air and n-Butane Mixtures Leading to Combustor Ignition Modeled using Effective Ionization Coefficients S.F. ADAMS, Air Force Research Laboratory, A.A. KUDRYAVTSEV, S.M. POPUGAEV, St. Petersburg State University, V.I. DEMIDOV, West Virginia University, C.Q. JIAO, ISSI Inc. — The process of electron attachment in electronegative air-hydrocarbon gas mixtures can be an impediment to the arc ignition process in a combustion engine. The optimized conditions to produce ignition include a gas mixture with a minimal ionization coefficient. Data on ionization rates and ion reactions in various air-hydrocarbon mixtures is necessary, though, for a proper theoretical analysis of the ignition process. The known set of cross-sections and rate constants for simple methane (CH_4) is often used and results extrapolated to heavier hydrocarbons. Recently, experimental data on cross-sections, ionization rates and ion reactions in n-butane (n-C_4H_{10}) were reported which allow for reliable models of ignition in more complex fuel mixtures. This paper presents an analysis of breakdown and ignition using air and n-butane mixtures.

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Date submitted: 17 Jun 2008 Electronic form version 1.4