Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Gas phase Boudouard disproportionation reaction between highly vibrationally excited CO molecules KATHERINE ESSENHIGH, YURII UTKIN, CHAD BERNARD, IGOR ADAMOVICH, WILLIAM RICH, Ohio State University, NONEQUILIBRIUM THERMODYNAMICS LABORATORIES TEAM
— The gas-phase Boudouard disproportionation reaction (1) between highly vibrationally excited CO molecules in nonequilibrium optically excited plasma has been studied in this work. CO(v) + CO(w) $\rightarrow$ CO_2 +C The experiments were conducted in a mixture of Ar and CO at different CO partial pressures. The cw CO laser beam (14 Watt) was used to create an optically pumped plasma in a small glass reactor. The vibrational distribution function (VDF) of CO was measured in the plasma region using the fourier transform infrared emission spectroscopy. Carbon dioxide production rate was determined from the absorption of CO_2 asymmetric stretch. Small amounts of helium was added to the mixture to alter the VDFs and change the of CO_2 production rate. The activation energy Ea $\sim$11eV was inferred by using the transition state theory to fit the experimental data. This activation energy is very close to the CO dissociation energy of 11.09eV. Such a high activation energy suggests that both colliding particles have to be in very highly excited vibrational states for the reaction (1) to occur. The total rate constant K_B for the reaction (1) was found to be $6{\cdot}10^{-17}cm^3/sec$.

Yurii Utkin

Date submitted: 19 Jun 2006 Electronic form version 1.4