ABSOLUTE NUMBER DENSITY MEASUREMENTS OF HYDROPEROXYL RADICAL IN A NANOSECOND PULSE DISCHARGE USING CAVITY RING-DOWN SPECTROSCOPY

KRAIG FREDERICKSON, *Department of Aerospace and Mechanical Engineering, The Ohio State University, Columbus, OH, USA*; TERRY A. MILLER, *Department of Chemistry and Biochemistry, The Ohio State University, Columbus, OH, USA*; IGOR V. ADAMOVICH, *Department of Aerospace and Mechanical Engineering, The Ohio State University, Columbus, OH, USA*.

A recently implemented cavity ring-down spectrometer has been used to perform absolute number density measurements of hydroperoxyl radical (HO_2) generated in a repetitive nanosecond-duration, pulse discharge sustained in a mixture of $H_2/O_2/Ar$. The probe source for the spectrometer is a custom-built, injection-seeded, optical parametric oscillator emitting an idler beam in the 1500 nm region accessing the first overtone ($2\nu_1$) of the O-H stretch. Water vapor was used as a standard species to characterize the spectrometer and provide estimates of the spectral linewidth, sensitivity, and noise level. A specially constructed ring-down cell, with the central portion consisting of rectangular quartz channel tubing and a pair of copper plate electrodes, was used to produce a repetitively pulsed discharge in a $H_2/O_2/Ar$ mixture. Narrow bandwidth cavity ring down spectra are acquired of a hydroperoxyl absorption feature composed of numerous closely spaced ro-vibrational lines centered at 6638.20 $\mathrm{cm}^{-1}$and number density is determined from the resulting spectral line. This is believed to be the first detection and quantitative measurement of hydroperoxyl radical produced in a nanosecond pulse discharge. The measured number density is compared to the value predicted by the kinetic model of a nanosecond pulse discharge in a reacting $H_2/O_2/Ar$ mixture.