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Spectroscopic Temperature and Number Density of Nitric Oxide in Laser-Induced Plasma JOSEF P. FLEISCHMANN, LAUREN D. SWAFFORD, MICHAEL J. WITTE, DAVID M. SURMICK, ALEXANDER C. WOODS, SULTAN A. BEHERY, CHRISTIAN G. PARIGGER , University of Tennessee Space Institute, JAMES O. HORNKOHL, Hornkohl Consulting — We report measurements of nitric oxide emission spectra subsequent to infra-red Nd:YAG laser-induced breakdown in air. Plasma is generated by focusing 160 mJ energy per pulse, 13 ns pulse-width, laser radiation at a wavelength of 1064 nm. The NO emissions are recorded for time delays of 25, 50, and 75 μs after plasma generation, utilizing a 0.64 meter Czerny-Turner type spectrometer with a 3600 grooves/mm grating, and an intensified linear diode array. The analysis utilizes accurate line strengths for selected bands in the ultraviolet region of 205 to 300 nm. Temperatures on the order of 6000 to 7000 Kelvin are inferred from the emission spectra. Comparisons are included with previous experimental studies in 1:1 mixture of N_2:O_2, where we deduced temperature and species densities using plasma predictions for various conditions and a so-called non-equilibrium air radiation code. The current work elaborates on details of two specific NO bands to evaluate as well accuracy of our line strength data. While the presented spectra, recorded in laser-induced plasma in air, are due to recombination processes following optical breakdown, results of our work on diatomic nitric oxide emissions are expected to be also applicable in chemical physics investigations of combustion.

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