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Metastable Oxygen Production by Electron-Impact of Oxygen JEFFREY HEIN, PAUL JOHNSON, ISIK KANIK, Jet Propulsion Laboratory, CHARLES MALONE, California State University, Fullerton — Electron-impact excitation processes involving atomic and molecular oxygen are important in atmospheric interactions. The production of long-lived metastable O(^{1}S) and O(^{1}D) through electron impact of atomic O and molecular O_2 play a significant role in the dynamics of oxygen-containing atmospheres (Earth, Europa, Io). Emissions from metastable O (^{1}S $\rightarrow$ ^{1}D) produce the well-recognized green light from terrestrial aurora. Electron-impact excitation to ^{1}S and ^{1}D are sensitive channels for determining energy partitioning and dynamics from space weather. Electron-impact excitation cross sections determined through fundamental experimental studies are necessary for modeling of natural phenomena and observation data. The detection of metastable states in laboratory experiments requires a novel approach, since typical detection techniques (e.g., fluorescence by radiative de-excitation) cannot be performed due to the long-lived nature of the excited species. In this work, metastable O is produced through electron impact, and is incident on a cryogenically cooled rare gas matrix. The excimer production and subsequent rapid radiative de-excitation provides measurable signal that is directly related to the originating electron-impact excitation process

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