ELECTRON-IMPACT SPECTROSCOPY OF ATOMIC IONS:

SULFUR AND THE 10 TORUS

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Use of the electron energy-loss technique, when combined with merged or crossed electron and ion beams, is a powerful method for measuring excitation cross sections in singly- and multiply-charged positive ions. Transitions which are optically-forbidden (either by spin, symmetry, or both) or optically-allowed can be accessed. In the merged-beams geometry presented here, the kinematic advantage allows one to measure cross sections at each inelastic threshold, since an electron with zero residual (final) energy in the center-of-mass frame still has several tenths of an eV in the laboratory frame. Recent results in electron excitation of allowed and forbidden transitions in the ions Mg //, Zn //, O //, and C // will be presented. New experimental results in e—S // scattering, including resonance contributions, for the transitions $3s^23p^33^1S^0 \rightarrow 3s^23p^33^3D^0 (\lambda 6732 \text{ Å})$, $^4S^0 \rightarrow ^2P^0 (\lambda 4076 \text{ Å})$, and $^4S^0 \rightarrow 3s3p^4^4P (\lambda 1256 \text{ Å})$ will be discussed. The electron energy range is threshold to several times threshold, or about 2-40 eV. Near-term extensions of this work to the study of e—S ///-V//, and e—O ///-V// using the new multiply-charged ion (MCI) facility at JPL will be outlined. Relevance to the 10 torus will be given for excitation of the many charge states of O and S.

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