

Abstract Submitted
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Electron-impact Ionization Rates of Niobium Oxides M. RASKOVIC, S. POPOVIC, L. VUSKOVIC, Old Dominion University — Electron-impact ionization rates are calculated for NbO, NbO₂, Nb₂O₄ and Nb₂O₅. These data were previously unavailable, but are necessary for understanding ion-beam or plasma-sheath based removal processes of layers of Nb oxides accumulated on the surface of super-conductive radio-frequency cavities for particle accelerators. Presence of oxide layers on the surface reduces the Q factor of the cavities by up to a factor of 2. Electronic structures of niobium oxides were described by several empirical basis sets. MO parameters were calculated using several Hartree-Fock and density functional methods. The results were tested with available experimental results on ground-state frequencies and appearance potentials. Electron-impact ionization cross-section data are generated using the Binary-Encounter-Bethe approximation. Ionization rates are calculated for three different sets of electron energy distribution functions, representing typical conditions in the oxide removal processes. Dissociative ionization cross-sections for generation of oxide ion fragments are included in calculation together with their estimated accuracy.

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