

Ionization of iridium ions in the Dresden EBIT studied by X-ray spectroscopy of direct excitation and radiative recombination processes

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Received 12 July 2001 and Received in final form 10 September 2001

Abstract. Ir^{q+} ($41 \leq q \leq 64$) ions with open-shell configurations have been produced in the electron beam of the room-temperature Dresden Electron Beam Ion Trap (Dresden EBIT) at electron excitation energies from 2 keV to 13 keV. X-ray emission from direct excitation processes and radiative capture in krypton-like to aluminium-like iridium ions is measured with an energy dispersive Si(Li) detector. The detected X-ray lines are analyzed and compared with results from multiconfigurational Dirac-Fock (MCDF) atomic structure calculations. This allows to determine dominant produced ion charge states at different electron energies. The analysis shows that at the realized working gas pressure of 5×10^{-9} mbar for higher charged ions the maximum ion charge state is not preferentially determined by the chosen electron beam energy needed for ionization of certain atomic substates, but by the balance between ionization and charge state reducing processes as charge exchange and radiative recombination. This behaviour is also discussed on the basis of model calculations for the resulting ion charge state distribution.

PACS. 32.30.Rj X-ray spectra 78.70.En X-ray emission spectra and fluorescence – 29.25.Ni Ion sources: positive and negative