New Transition Probabilities for Trans-Iron Elements: Zn IV

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Most of our knowledge about stars comes from the interpretation of their spectra. Spectral analysis based on adequate model atmospheres is a pre-requisite to determine precisely photospheric properties like effective temperature, surface gravity, and element abundances. For hot stars, spectral analysis based on non-local thermodynamic equilibrium (NLTE) model-atmosphere technique is mandatory. For the NLTE modeling, reliable transition probabilities are required, not only for those (few) prominent lines that were identified in the observation but for the complete model ions which are used in the model-atmosphere calculations.

We present highly accurate transition probabilities of Zn IV lines in the ultraviolet wavelength region. These were calculated using Cowan's atomic code based on the pseudo-relativistic Hartree-Fock (HFR) method. A large number of interacting configurations were considered for ab initio calculations and the optimized energies were used to produce accurate transition probabilities and Ritz wavelengths for the parametric calculations. An erroneous wavelength would yield delusive transition probabilities. Here, we critically evaluated all the reported spectroscopic Zn IV data, and the optimized levels belonging to the $3d^9$, $3d^8 4s$, $3d^8 4p$, and $3d^8 4d$ were used in the parametric calculations. We compare our results with other calculations and observations of the DA-type white dwarf G191−B2B.