K-Shell Photoabsorption of Magnesium Ions

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Synopsis We report the results of extensive R-matrix calculations for the X-ray photoabsorption of all magnesium ions in the vicinity of the K-edge.

With the improved spectral resolution of launched X-ray telescopes, there is a demand for highly-accurate K-shell photoabsorption cross sections. Such data are needed for modeling astrophysical plasmas, interpreting the observed spectra from distant cosmic emitters, and determining the elemental abundances of the interstellar medium (ISM). Previously, we have computed reliable K-shell photoabsorption calculations for oxygen [1, 2], neon [3, 4], and carbon [5] ions, and these results were used for astrophysics modeling purposes [2, 4, 6].

We use the state-of-the-art R-matrix methods [7] to calculate the K-shell photoabsorption cross sections for magnesium ions, which is modified by including the important spectator Auger broadening and inner-shell relaxation effects [8]. Radial orbitals are generated by using multi-configuration Hartree-Fock methods, where single and double promotions to correlating pseudoorbitals are included in our configuration interaction expansion to account for important orbital relaxation due to K-shell vacancy.

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