Theoretical study of the K-shell x-ray emission of krypton ionized by $52-200$ MeV/u Xe^{54+} ions

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Synopsis A detail theoretical invesigation of the K-shell satellite and hypersatellite x-ray radiation structure of krypton ionized by impact with $52-200$ MeV/u bare xenon ions is reported.

Recently an essential progress was achieved at measuring of radiation spectra in quasi-symmetric highly-charged heavy ion-atom collisions at middle rage of collision energies. Thus an investigation of the Kr, Xe + Xe^{54+} collisions at 52-, 94-, 146, 197-MeV/u collision energies was carried out in IMP (Lanzhou, China) [1]. While the collisions Xe + Xe^{54+}, Xe^{52+} at 50 MeV/u were studied in GSI (Darmstadt, Germany) [2]. The present work is devoted to theoretical calculation of the K-shell satellite and hypersatellite x-ray radiation structure of krypton ionized by impact with $52-200$ MeV/u bare xenon ions.

Method of calculations employs an independent particle model, with en effective single-electron Dirac-Kohn-Sham operator [3]. Solving of the single-electron equations is based on the coupled-channel approach with atomic-like Dirac-Sturm-Fock orbitals, localized at the ions (atoms) [5]. Many-particle probabilities are calculated in terms of single-particle amplitudes employing the formalism of inclusive probabilities [4]. The analysis of the post-collisional processes resulting in the target K-shell x-ray emissions is based on the fluorescence yields, the radiation, and Auger decay rates, and allows one to derive intensities of the x-ray emission and compare them with experimental data. The method of calculation takes into account the dynamics of all electrons in the system. The role of relativistic and many-particle effects is analyzed.

References

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