

Manifestation of the 4d- ϵf giant resonance in the $N_{4,5}OO$ Auger effect in Xe

I.D. Petrov¹, B.M. Lagutin¹, V.L. Sukhorukov², A. Ehresmann³, and H. Schmoranzer⁴

¹Rostov State Transport University, 344038, Rostov-on-Don, Russia

²Institute of Physics, Southern Federal University, 344090, Rostov-on-Don, Russia

³Institut für Physik, Universität Kassel, D-34132 Kassel, Germany

⁴Fachbereich Physik, Technische Universität Kaiserslautern, D-67653 Kaiserslautern, Germany

Presenting Author: sukhorukov_v@mail.ru

The high resolution $N_{4,5}OO$ Auger spectrum of Xe [1] is a challenge example to check the degree of ability of the theoretical approximations. There exists substantial difference between theory and experiment even in the most sophisticated investigation of Kivimäki *et al.* [2] (see Fig. 1). In our recent work on the 4d⁹6p resonant Auger decay of Xe [3] we revealed that the partial 5p5p-4d ϵg decay amplitude is strongly influenced by the 5s5p-4d ϵf channel. This finding motivated us to revive the theoretical study of the normal $N_{4,5}OO$ Auger decay in Xe.

We applied the configuration interaction Pauli-Fock approximation with core polarization (CIPFCP) [4]. The following many-electron effects appeared to be very important: (i) inter-channel interaction of all final-state Auger channels; (ii) polarization of the core by the outgoing electron; (iii) dipole polarization of the electron shells described by the 5p5p-5s(n/ϵ) ℓ excitations [5]; (iv) reduction of the effective Coulomb interaction via inclusion of highly-excited configurations [5]. Taking into account these effects, especially the interaction between the 5s²5p⁴(¹D) ϵg and 5s¹5p⁵(¹P) ϵf decay channels, reduced the probability of the 5p5p-4d ϵg Auger decay by more than an order of magnitude.

Computed widths of the N_4 and N_5 levels agree with the measured ones within 2%. The shape of the computed $N_{4,5}OO$ Auger spectrum (Fig. 1) and the Auger-electron angular distribution parameters are also in much better agreement with the measured values than the previous theoretical data.

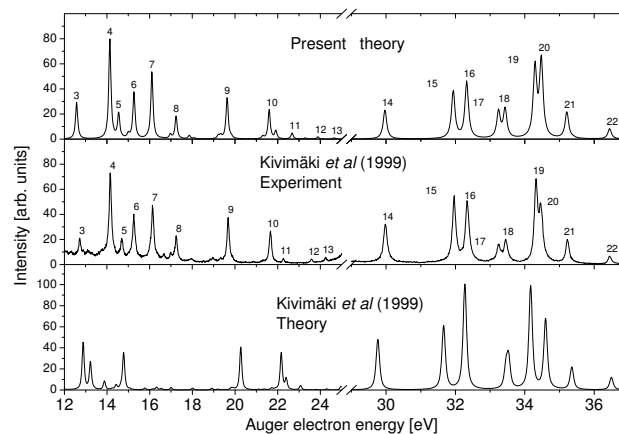


Figure 1: Experimental ([2], middle panel) and theoretical (present calculation - upper panel, [2] - lower panel) $N_{4,5}OO$ spectra of Xe corresponding to the exciting-photon energy of 95.1 eV.

References

- [1] L. O. Werme, T. Bergmark, K. Siegbahn Phys. Scr. **6**, 141–150 (1972)
- [2] A. Kivimäki *et al.* J. Electr. Spectr. Relat. Phenom. **101-103** 43-47 (1999)
- [3] B. M. Lagutin *et al.* J. Phys. B: At. Mol. Opt. Phys. **45** 245006 (2012)
- [4] V. L. Sukhorukov *et al.* J. Phys. B: At. Mol. Opt. Phys. **45** 092001 (2012)
- [5] B. M. Lagutin *et al.* J. Phys. B: At. Mol. Opt. Phys. **29** 937–976 (1996)