

X-ray atomic absorption of cesium in L-edge region

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In the x-ray absorption of pure elements in the monatomic state, the interaction between the photon field and the atomic quantum system is directly measured. In addition to the prevailing process of photoelectric absorption, small contributions of collective excitations, real and virtual, of the atom can be discerned. In this way, complex, multiple-excitation atomic states can be studied.

X-ray absorption of cesium vapour in the energy region of L edges was measured at the beamline C of Hasylab, DESY Hamburg*. The vapour was contained in a stainless steel absorption cell with beryllium windows, heated to 700 °C in a tubular oven. Similar series of double excitations features are found above all three L edges. The features can be decomposed into contributions of shakeup, shakeoff and double excitation channels. The identification of the channels, superior to the low-resolution scheme deduced from the Cs K edge absorption spectrum, is based on the comparison with the data for the neighbour element xenon. In the L edge profiles, basically different for L₁ and L₂/L₃ edges, the Rydberg series and valence coexcitations are resolved. The shift of the edge positions between atomic and solid cesium is a good check of theoretical models.

In the atomic absorption the polarization effects of the 2p subshells can be studied in the pure form. An analytical approximation for the effect is developed, to improve the description of the atomic absorption background in the XAFS (x-ray absorption fine structure) techniques of structure analysis.

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