ROLE OF THE AUTOIONIZING STATES IN THE ELECTRON-IMPACT EXCITATION OF THE Cd^+ ION RESONANCE LINES

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Electron-impact excitation of the resonance $5p\ ^2P_j$ levels of the Cd^+ ion has been studied from the threshold up to 12 eV. Experiment was carried out in the crossed electron and ion beams using the optical spectroscopy method. The Cd^+ ion, produced in the low-voltage discharge (<12 eV) ion source, were formed into a beam and separated from the neutral Cd atoms by a 90° electrostatic capacitor. The ion beam (E=1 keV, I=0.5-1 μA) was intersected at right angle by a ribbon electron beam (E= 4-15 eV, I=5-50 μA, 0.5 eV energy spread (FWHM)) at a pressure of 10^{-8} Torr. Radiation was spectrally separated by means of 70° vacuum monochromator using the Seya-Namioka optical scheme. The signal of (1-20) s^{-1} magnitude at signal to noise ratio of 1/2-1/20 was extracted using a modulation technique. The experimental data were measured and processed using a PC-CAMAC system.

The combined excitation functions for both resonance lines (λ226.5 nm and λ214.4 nm) of Cd^+ have revealed the resonance structure (see fig.) not observed earlier [1]. Experimental results are compared with the close-coupling calculations carried out in the foure states ($5s-5p-4d^95s^2-6s$) approximation. The structure is due to the electron capture by the ion resulting in the formation of the $4d^{10}5p(^2P_{3/2})nl$, $4d^95s^2(^2D_{5/2,3/2})n_1l_1$, $4d^{10}6s(^2S_{1/2})n_2l_2$ autoionizing states of the Cd atom, the subsequent decay of which leads to the population of the resonance levels of the Cd^+ ion.

References

1. K.Hane et al. //J.Phys.B. 1983. V.16. P.629; Phys.Rev. 1983. V.27. P.124.