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Calculations of electron scattering from cadmium

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Synopsis Electron scattering from cadmium atoms has been investigated theoretically using the Convergent Close-Coupling (CCC), Relativistic Optical Potential (ROP) and Relativistic Distorted Wave (RDW) methods. Differential, integrated and ionization cross sections have been calculated between 1 and 500 eV and compared against experimental data. Electron impact coherence parameters have also been calculated and compared against available experiment.

The CCC, ROP and RDW methods have been very successful in the description of electron scattering from atoms and ions. Here we apply these methods to the calculation of electron scattering from the ground state of Cd (5^1S_0).

In the CCC method [1], the Cd atom is modelled as two active electrons above a closed Hartree-Fock core. The Hamiltonian of the Cd⁺ ion is diagonalized in a large Sturmian (Laguerre) basis. The resulting one-electron orbitals are used in a two-electron configuration-interaction calculation to obtain a set of Cd target states. A total of 183 states are used to expand the total wavefunction of the e-Cd scattering system and formulate a set of coupled Lippman-Schwinger equations for the T-matrix.

The ROP method of Chen *et al* [2] for elastic scattering uses an optical potential consisting of a static, polarization and imaginary absorption potential which accounts for loss of incident electron flux into the excited and ionization channels. The RDW method as applied to the excitation of Cd has been described in Srivastava *et al* [3]. We have used this method to calculate the excitation of the 5s valence electron to the 5p, 5d and 6s levels.

The CCC method has been executed for energies up to 500eV. Electron impact coherence parameters have been calculated for the excitation of the 5^1P_1 state. As an example, we present in Figure 1 the P_3 Stokes parameter for excitation at 80eV.

Furthermore, differential cross sections have been calculated for elastic scattering and excitation of the 5^3P_1 , 5^3P_2 , 5^1P_1 , 6^3S_1 , 6^1S_0 , 5^1D_2 , 6^1P_1 , 7^1S_0 , 6^1D_2 , 7^1P_1 , 8^1S_0 , 7^1D_2 and 8^1P_1 states. Results have been compared with the ex-

perimental data of Marinković *et al* [4] and will be presented at the conference.

Figure 1. Stokes parameter P_3 for excitation of the 5^1P_1 state of cadmium by 80eV electrons. Experimental data is due to Piwiński *et al* [5]. The theoretical RDW results are those presented in Srivastava *et al* [3].

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