Electron impact excitation of rubidium

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Synopsis The electron energy-loss spectrum of rubidium at 40 eV and scattering angle 8^o has been recorded. The noticeable features are analysed. Differential cross sections for the resonance excitation are determined.

The electron structure of the ground state of the alkali metals consist of one valence electron outside the core which is a closed shell system. This electronic structure makes alkali metals, including rubidium, very interesting for theoretical and experimental investigation.

Despite practical and theoretical interest in electron impact data for rubidium, the existing experimental data in literature are very sparse. To the best of our knowledge, in only one paper [1] the electron energy loss-spectra are presented (for impact energy of 20 eV and scattering angles of 5^o, 73^o and 110^o).

The apparatus used for the measurement is described in [2], operated in energy-loss mode. The estimated overall system resolution was 160 meV. The energy scale was calibrated as in [3].

The electrons were generated by the monochromator consisting of cylindrical lenses and a hemispherical energy selector. The effusive atomic beam was generated by resistively heating oven containing rubidium of high purity. The measurements are performed at temperature of 510 K. An atomic beam effusing in a vertical direction was intersected perpendicularly with a monoenergetic electron beam. Electrons scattered at a given angle were accepted by analyser, which was movable around the atomic beam.

Figure 1 shows the typical energy-loss spectrum recorded at incident electron energy of 40 eV and scattering angle of 8^o. The spectrum consists of an elastic peak and the peaks corresponding to the 5 $^2P_{1/2,3/2}$ (ΔE = 1.559 eV; 1.589 eV), $^2D_{3/2,5/2}$ (ΔE = 2.399 eV), $^1S_{1/2}$ (ΔE = 2.496 eV), and 6 $^2P_{1/2,3/2}$ (ΔE = 2.940 eV; 2.950 eV) states. Present spectrum is similar to spectra in [1]. The excited states were not resolved because of the limited resolution of the spectrometer. Differential cross sections will be compared with existing calculations [4, 5].

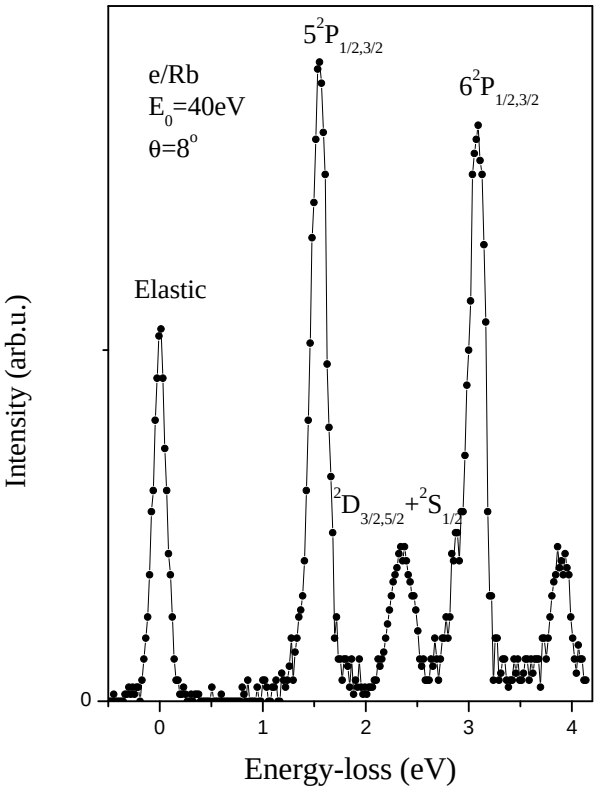

Figure 1. Energy-loss spectrum of rubidium.

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