Ejected electron spectroscopy of autoionizing states of neon by electron impact

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Synopsis Electron impact studies of autoionizing states and resonances in neon were performed by measuring both energy and angular distributions of ejected electrons. The present abstract is focused on $2s2p^63s(^1S)$ state, which was studied as a function of the impact electron energy, below 100 eV, at the scattering angle of 10°.

Autoinizing states and resonances in neon, lying above the first ionization limit (21.56 eV), can be excited by electrons, photons and ions. After excitation they can decay by electron ejections. We have studied autoionizing states in neon using electron spectrometer OHRHA described earlier [1]. Briefly, it consists of an electron gun, a hemispherical analyzer, a hypodermic needle as a source of effusive beam of target gas and a Faraday cup as a collector of incident electrons. Ultimate projected energy resolution is of the order of 10 meV. In the present work, the overall uncertainty of the energy scale calibration was 0.06 eV (more details about the calibration are given in [2]).

The present study was focused on the feature $2s2p^63s(^1S)$ that appears at the kinetic energy of 22.20 eV (excitation energy of 43.76 eV). At higher impact energies (above 80 eV) and a fixed scattering angle of 90° the feature shows asymmetric form on the higher energy side due to the presence of nearby lying resonance. The separation between the two features becomes visible at 10°. Furthermore, the feature $2s2p^63s(^1S)$ (short vertical line) shows a dramatic change in form with changing the impact energy (see Figure 1). Below 80 eV the maximum disappears, while a minimum of a typical resonance form appears at impact energy of about 55 eV. Ejected energy position of this minimum was measured at 22.26 eV (long vertical line). It should be noted that the latter value is 0.060 eV above the $2s2p^63s(^1S)$ state (22.20 eV), thus explaining an apparent enhancement of this state in the ejected electron spectra.

The other feature $2s2p3p(^1P)$ found at 23.98 eV (or the excitation energy of 45.54 eV), shown in Figure 1 by a long vertical line, have been used as a calibration point, which position is not influenced by electron energies far from the threshold. More details from the analysis will be presented at the conference.

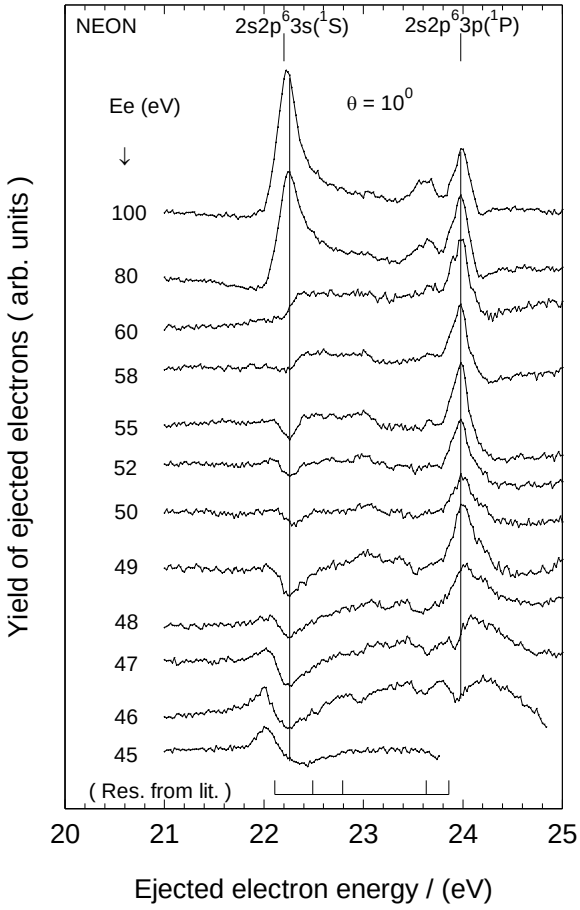

Figure 1. Ejected electron spectra of neon obtained at an ejection angle of 10°. Energy width per channel was 0.020 eV. The impact electron energies (E_e) are shown on the left hand side. The previously published resonance positions [3] are shown at the bottom of the figure.

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References

[1] J.J. Jureta, A.R. Milosavljević and B.P. Marinković 2011 *Proc. 5th CEPAS, Belgrade, Serbia* p.126.
[2] J.J. Jureta, A.R. Milosavljević and B.P. Marinković 2012 *Proc. 26th SPIG, Zrenjanin, Serbia* p. 47 – 50.
[3] S.J. Buckman and C.W. Clark 1994 *Rev. Mod. Phys.* **66** 539-655.

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