On the mean kinetic energy of recoil ions produced in 3.5keV electron-argon collisions

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Measurements of the charge state-resolved mean kinetic energy (MKE) of argon recoil ions in coincidence with the energy selected electrons produced in 3.5keV electron collisions with argon atoms have been carried out using the TOF mass spectrometry in conjunction with the electron spectroscopy techniques. The values of MKE of recoil ions are deduced from the widths of their TOF peaks. The measured average values of MKE of Ar^{+}, Ar^{2+}, $Ar^{3+}$and Ar^{4+} recoil ions are found to be respectively 0.023±0.002eV,0.066±0.003eV,0.097±0.005eV and 0.134±0.007eV in the ejected electron energy range of 120eV-210eV. Additionally, the variation of charge state ratios (σ_n/σ_1) and average charge state ratios ($\sum n\sigma_n/\sigma_n$) of recoil ions as a function of energy of correlated electrons is also studied. Furthermore, dependence of the MKE of recoil ions on the observed charge states is determined and its results are presented and discussed. Survey of the results obtained from the present measurements suggests that the MKE of recoil ions depends not only on their charge states but also weakly on the specific range of energy of ejected electrons in the considered collision reaction. Presently we are not aware of any theoretical calculations that can be compared with our results.

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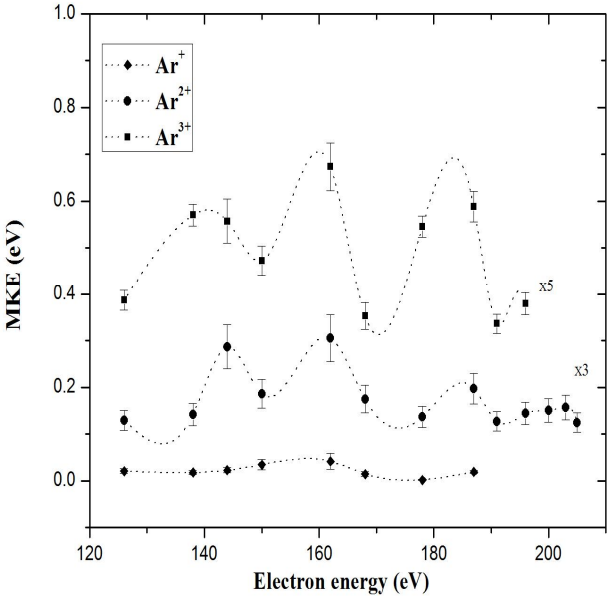

Figure 1 : The charge state-resolved MKE of Ar^{n+} (n=1-3) recoil ions observed in coincidence with L_{23}-$M_{23}M_{23}$ Auger electrons produced in 3.5keV electron collisions with argon atoms. The MKE data corresponding to Ar^{2+} and Ar^{3+} are multiplied by a factor of 3 and 5 respectively for better presentation. Dotted line curves shown in the figure are simply to guide eyes.

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References

[1] C.L. Cocke, Phys. Rev. A. 20 (1979) 749.

[2] H.W. Drawin, Phys. Scr. 24 (1981) 622.

[3] S.Prajapati et.al. (communicated to NIM B)

[4] S. Kumar et.al. (Accepted Ind. J. of Phys,2017)