# Study of multiply charged Argon-ions formed by decay of 2p-hole state under $e^-$-Ar collision employing energy selected ion coincidence technique

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Inner shell de-excitation of atoms and molecules give rise to rearrangement of internal electron distribution, for light atoms non-radiative and for heavier atoms radiative transition are dominant de-excitation mechanisms. Correlated many-particle dynamics in Columbic systems is one of today's grand challenges in physics. Multi-ionization studies on atoms and molecules provide information on the correlation between the electrons and also on the dynamics of the ionization processes [1]. There are various applications of such study particularly in the field of atomic, molecular and optical (AMO) physics, atmospheric physics, plasma physics and many more fields.

In the present work we have employed energy selected electron-ion coincidence technique to study the decay pathways of 2p hole created under the impact of continuous electron beam having kinetic energy 3.5 keV. Several non-radiative inner shell transitions e.g. Auger process, Auger cascade transition, Coster-Kronig, auto-ionization, shake processes etc. have been investigated which lead to the formation of multiply charged Argon ions from $Ar^+$ to $Ar^{4+}$ for 18 energy selected electrons (see Fig.1). The relative correlation probability for the formation of various charge state of Argon ions as a function of electron energy have been determined experimentally.

Several other aspects and implications of the formation of multiply charged Argon ions using our recently developed experimental set-up [2] will be presented and discussed.

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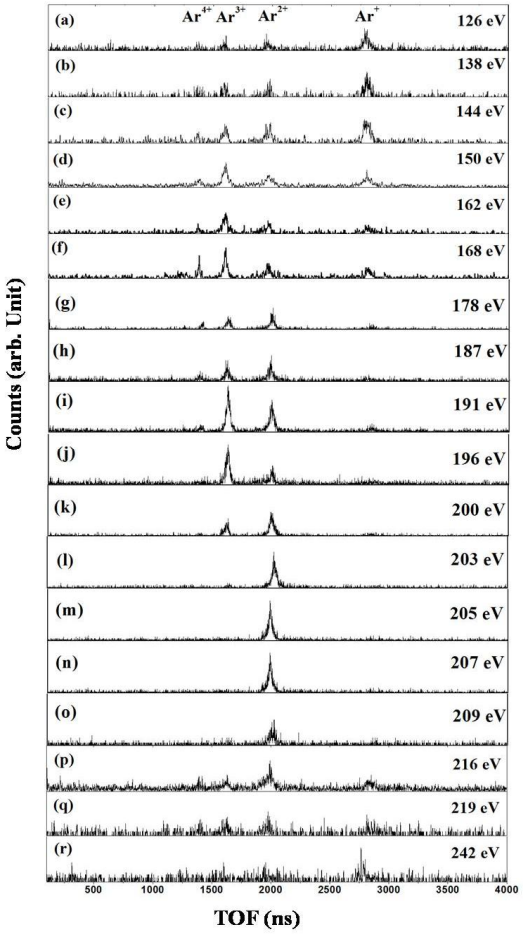


**Figure 1.** : TOF spectra of multiply charged Argon ions observed in coincidence with 18-energy selected electrons in 3.5 keV electron collisions with free argon atoms [3].

## References

[1] Egil Andersson, 2010, *Faculty of Science and Technology, Uppsala* Dissertations 743.

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

[3] S. Kumar et al., 2017 (Accepted, EPJD)