Recent Results in Resonant Auger Spectroscopy of Rare Gases

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A major part of resonant Auger studies of rare gases has been performed on the decay of the core-excited Ar $2p^{-1}nl$, Kr $3d^{-1}np$, and Xe $4d^{-1}np$ states [1], these being experimentally most accessible due to their suitable excitation energies and rather high cross sections. During the last eight years or so, very detailed information has been obtained from these spectra by utilizing the so-called Auger resonant Raman effect. Briefly, the resolution of resonant Auger lines can be enhanced by populating the core-excited state with a photon bandwidth that is narrower than the state's lifetime width.

The continuing development of synchrotron radiation sources and monochromators means that increasingly higher photon resolution can be used at ever larger photon energies in gas phase studies. Recently, a sub-lifetime instrumental resolution has been achieved in the studies of the Ne $1s^{-1}np$ ($n\geq3$) resonant Auger spectra, revealing details of these prototype decay spectra. Higher photon fluxes have also allowed weaker excitations and their decay to be studied; examples include Xe 3d $\rightarrow$ np and Ar 2s $\rightarrow$ np excitations. Resonant Auger spectroscopy could also help to interpret the electron excitations occurring at the Xe 4p threshold, which as yet are not completely understood.

References

[1] G.B. Armen, H. Aksela, T. Åberg, and S. Aksela, J. Phys. B 33, R49 (2000).