Inner-shell photoionization of astrophysically relevant atomic ions

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Synopsis In my talk, I will summarize recent experimental work on inner-shell (multiple) photoionization of atomic ions that has been carried out by employing the photon-ion merged-bemas technique at the PIPE end-station of beamline P04 of the PETRA III synchrotron light source operated by DESY in Hamburg, Germany.

Photoabsorption cross sections of ions of astrophysically elements are relevant for the derivation of opacities and also serve for inferring the elemental abundances, e.g., in the interstellar medium from astrophysical x-ray absorption spectra [1]. In particular, accurate resonance energies are required for being able to discriminate between, on the one hand, the various ion charge states in the gas phase and, on the other hand, atoms that are bound in the minerals that make up the interstellar dust.

The experimental method of choice is the photon-ion merged beam technique [2], which allows one to measure photoionization and photoabsorption cross sections on an *absolute* scale. Using this technique, we have performed a number of benchmark studies on K-shell photoionization of C^+ [4, 5], C^{2+} [6], C^{4+} [7], O^- [8], F^- [9], Ne^+ [10], Si^- [11], Si^+, Si^{2+}, Si^{3+} [12] and on L-shell ionization of Fe^+ [13, Fig. 1], Fe^{2+} [14], Fe^{3+} [15], Ar^+ [16].

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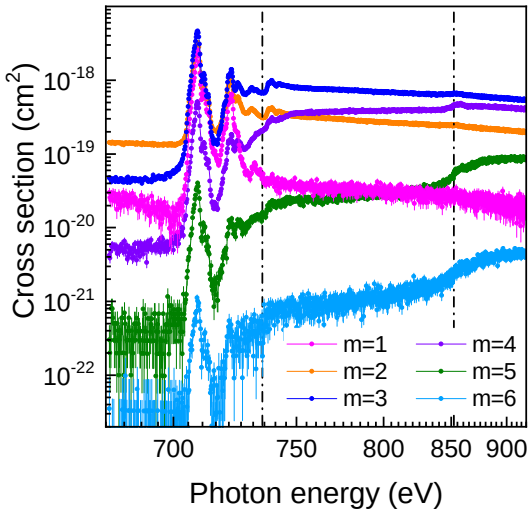

Figure 1. Experimental cross sections for m-fold photoionization of Fe^+ ions [13] measured at the photon-ion end-station PIPE at the PETRA III synchrotron light source. Note the large dynamic range of the PIPE setup.

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