2 - 10 Multiply Ionization of Al Atom Induced by Ar^{11+} Ions near Bohr Velocity

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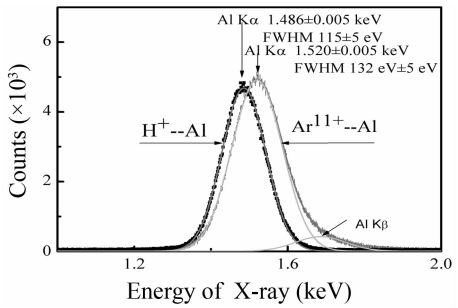

Fig. 1 Al K-shell X-ray produced by H^+ and Ar^{11+} ions impact.

During the highly charged heavy ion-atom collisions, except for the inner-shell ionization, the outer-shell electrons of the target atom may be multiple ionized[1,2]. That lead the X-ray has a higher energy and broader width than that of the atom. Besides, the florescence yield may be changed due to the absence of the outer-shell electrons[3,4]. Based on the 320 kV high voltage experimental platform, we have compared the X-ray emission of Al induced by proton and Ar^{11+} ions. Multiple ionization of Al atom was investigated.

In Fig. 1, it is obvious that the X-ray induced by Ar^{11+} ions has a larger energy and bigger width than that by proton. That allows us to estimate that 3-4 L-shell electrons of the Al atom are multiple ionized by Ar^{11+} ions impact. Moreover, the Kβ X-ray emission is enhanced for the Ar^{11+} ions impact, which also provide a powerful evidence for the multiply ionization.

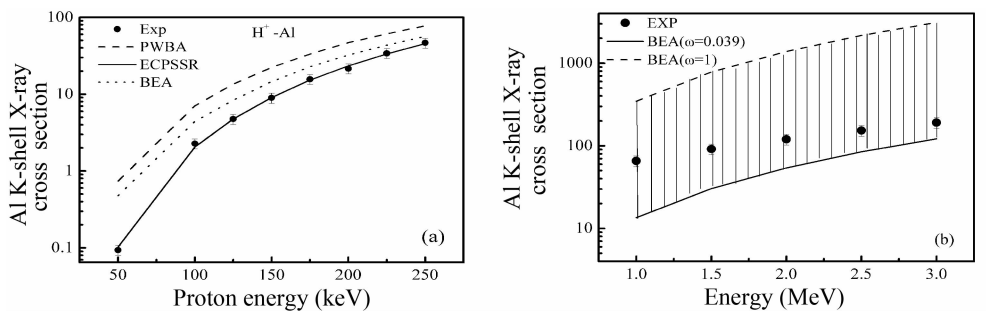

Fig. 2 Production cross section of Al K-shell X-ray by proton and Ar^{11+} ions.

The X-ray production cross section was shown in Fig. 2 as a function of the incident energy. For proton impact, the ECPSSR agrees well with the experimental data within error. However, for Ar^{11+} impact, BEA may be more suitable to describe the K-shell ionization, and the effect of multiply ionization should be considered in calculating the X-ray production cross section.

References

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