Double differential ionization cross sections of positron impact on argon

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R I Campeanu[1], M Alam[1]

[1] Department of Physics and Astronomy, York University, Toronto, Canada M3J 1P3

Synopsis The ionization of the 3p orbitals of argon by 100 eV incident positrons is studied with the DWBA approximation.

Differential cross section measurements provide a more stringent test of theory than do their integral counterparts. For positron impact, relatively few measurements have been undertaken, mainly due to the serious intensity limitation of the beams available in most laboratories. This is also the reason why many of the positron impact studies dealt with the argon-gas target, where the larger cross section can partially offset the low positron flux.

In this paper we obtain double differential cross sections for positron impact ionization of argon using the Distorted Wave Born Approximation (DWBA). We compare our results with existing experimental results [1] and with Classical-Trajectory Monte Carlo (CTMC) data [2].

We shall present results for all cases studied experimentally and we shall demonstrate that the DWBA models agree fairly well with the experimental results. Figure 1 shows our double differential cross sections for the 100 eV positrons scattered at 30^o after the argon ionization.

We show that the post-collision interaction between the scattered positron and the ejected electron through a Gamow factor improves the agreement between the DWBA data and experiment only for the case of low energy scattered positrons.

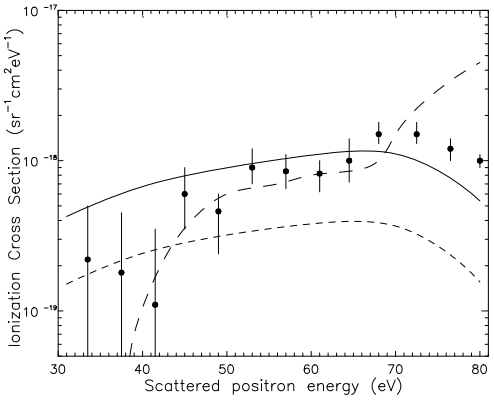

Figure 1**.** Double differential cross sections for the 100 eV positrons scattered at 30^o after the Ar ionization. The continuous curve and the short dashed curve correspond to our DWBA calculation without and with the Gamow factor, while the long dashed curve corresponds to the CTMC data of Sparrow and Olson (1994). The experimental results are the relative measurements of Kover et al (1993) scaled to fit the CTMC results.

References

[1] Kover A , Laricchia G and Charlton M 1993 *J. Phys. B: At. Mol. Opt. Phys.* **26** L575
[2] Sparrow R A and Olson R E 1994 *J. Phys. B: At. Mol. Opt. Phys.* **27** 2647

E-mail: campeanu@yorku.ca