

IONIZING COLLISIONS BY POSITRONS WITH He AND CO₂

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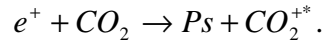
Abstract

Ionization of an atom or molecule by positron impact can occur via a number of channels: annihilation ($e^+ + A \rightarrow A^+ + 2\gamma$), Positronium formation ($e^+ + A \rightarrow A^+ + Ps$) and direct ionization ($e^+ + A \rightarrow A^+ + e^+ + e^-$). Recent detailed measurements of the total ionization cross-section, encompassing all of the above processes, for ($Q_i^t(He)$) from threshold up to 850eV have been performed [1]. In conjunction with available data for the direct ionization cross-section ($Q_i^+(He)$), these allow the extraction of the Positronium formation cross-section [2] ($Q_{Ps}(He)$) according to:

$$Q_{Ps} = Q_i^t - Q_i^+ \quad (1)$$

Comparisons with available theoretical and experimental results reveal some discrepancies which will be discussed at the workshop.

The investigation is currently being extended to Carbon Dioxide, with particular attention given to the simultaneous process of Positronium formation with an ionic excitation [3], i.e,



This process is being studied in detail by measuring ion fragment – photon coincidences and the energy dependence of the cross-section for this simultaneous process ($Q_{sim}(CO_2)$) is reported. Total ionization cross-section ($Q_i^t(CO_2)$) is being measured at the same time. From these and additional measurements of $Q_i^+(CO_2)$, $Q_{Ps}(CO_2)$ will be extracted according to (1) above and preliminary results will be presented at the workshop.

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References

- [1] M Szłuińska, D J Murtagh, P Van Reeth and G Laricchia 2005 in preparation
- [2] G Laricchia, P Van Reeth, M Szłuińska and J Moxom *J. Phys. B: At. Mol. Opt. Phys.* **35** 2525
- [3] G Laricchia, M Charlton and T C Griffith 1988 *J. Phys. B: At. Mol. Opt. Phys.* **21** L227-L232