Positron scattering from Biomolecules

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Positron scattering from Biomolecules

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Synopsis Experimental progress in positron scattering from biologically relevant molecules.

We will present our recent work on positron scattering from biologically relevant molecules. This program focuses on the nucleobases: Adenine, Guanine, Thymine, Cytosine and Uracil [1]. These molecules are solid at room temperature. This requires an oven to produce a vapour of the molecule of choice. The aim of this work is to provide absolute positron scattering information for the nucleobases. Currently, we are focusing on measurements of the grand total scattering cross section and the positronium formation cross section. Comparisons will be made between the available electron and positron scattering data including our work in a number of other targets of interest.

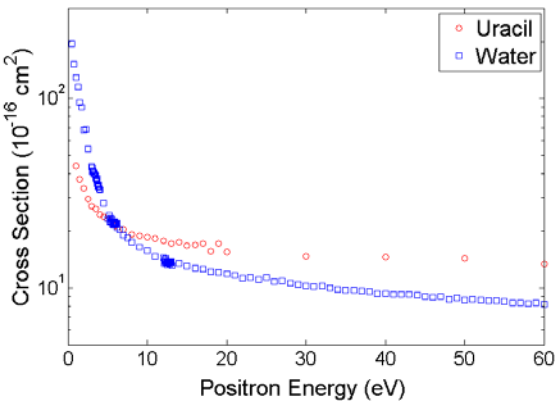

Figure 1. Total scattering cross section for uracil [1] and water [3]. The uncertainties have been suppressed.

The experimental measurements were carried out using the low-energy positron beam line at the Australian National University. The magnetically confined positron beam can be tuned from below 1 eV up to 200 eV with a variable energy resolution, which was typically between 60 and 100 meV. The oven temperature was monitored by a number of calibrated platinum resistive thermal devices (PRTDs) and a thermocouple, and controlled by varying a resistive heater (thermocoax). The number density is required for the normalization of the experimental results, and was determined via the vapour pressure curves for the target molecule combined with measurements of the oven temperature. Uncertainties in the temperature measurement and uncertainties in the vapour pressure curve constitute the largest systematic uncertainty. The uncertainty due to the statistical fluctuations in the measurement was typically less than 3 %. The positron energy-loss spectrum was used to determine the partial scattering cross sections. We will present details of the experimental procedure along with the design and operation of the oven based source. The results produced for the various targets will be presented.

References

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[3] C. Makochekanwa *et al* 2009 *New J. Phys.* **11** 103036

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