Contribution ID: **148** Type: **Poster**

Positronium Formation on Polymers Studied by Low-Energy Positrons

Tuesday, 5 December 2023 14:00 (3 hours)

A low-energy monoenergetic positron beam can be used to implant positrons near the surface of materials. In polymers and in particular in porous materials positrons can form positronium (Ps). Even at greater implantation depths Ps can diffuse back to the surface and be emitted if the material has an open porous structure, i.e., the pores create a path to the outside. Therefore, we can qualitatively compare the porosity of materials by measuring the amount of freely decaying Ps depending on the positron implantation energy. By using a new algorithm we optimized the magnetic guiding of our monoenergetic laboratory positron beam in order to achieve a sharp focus at lowest implantation energies. We performed first measurements on the 3-gamma decay of ortho-Ps in order to study the Ps formation at the surface of PMMA and Kapton, forming a high and low amount of Ps, respectively.

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Session Classification: Poster Session

Track Classification: Positrons