

## Physics &gt; Atomic Physics

# Measurement of the ortho-positronium confinement energy in mesoporous thin films

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In this paper, we present measurements of the ortho-positronium emission energy in vacuum from mesoporous films using the time of flight technique. We show evidence of quantum mechanical confinement in the mesopores that defines the minimal energy of the emitted Ps. Two samples with different effective pore sizes, measured with positron annihilation lifetime spectroscopy, are compared for the data collected in the temperature range 50-400 K. The sample with smaller pore size exhibits a higher minimal energy ( $\approx 73$  meV), compared to the sample with bigger pores ( $\approx 48$  meV), due to the stronger confinement. The dependence of the emission energy with the temperature of the target is modeled as ortho-positronium being confined in rectangular boxes in thermodynamic equilibrium with the sample. We also measured that the yield of positronium emitted in vacuum is not affected by the temperature of the target.

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