

Abstract for an Invited Paper
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Resonances in Positron-molecule Interactions¹

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The development of cold, trap-based beams has enabled high-resolution, energy-resolved studies of positron scattering and annihilation processes [1]. This talk focuses on three topics in this area. For hydrocarbon molecules such as alkanes (C_nH_{2n+2}), giant enhancements in annihilation rates are observed due to vibrational Feshbach resonances. The dependence of the rates on positron energy provides evidence that positrons bind to these molecules and a measure of the binding energies [1]. Recent results include evidence for a second, “positronically excited” bound state and new data for the methane series, CH_3X , where X is a halogen. Other “resonance-like features” are sharp increases in the near-threshold electronic excitation cross sections for CO and N_2 [2], and in the vibrational excitation cross sections for CO, CO_2 and CH_4 [3, 4]. Outstanding questions and the relationship of these observations to available theoretical predictions will be discussed.

1. C. M. Surko, G. F. Gribakin, and S. J. Buckman, *J. Phys. B* **38**, R57 (2005).
2. J. P. Marler and C. M. Surko, *Phys. Rev. A* **72**, 062713 (2005).
3. J. P. Marler and C. M. Surko, *Phys. Rev. A* **72**, 062702 (2005).
4. J. P. Marler, G. F. Gribakin and C. M. Surko, *Nuclear Instrum. and Meth. B*, in press (2006).

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