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New results for positron-molecule Feshbach resonances and bound states.¹ J.A. YOUNG, L.D. BARNES, C.M. SURKO, University of California, San Diego — Monoenergetic positrons from a trap-based beam have been used to measure the first energy resolved positron-on-molecule annihilation spectra [1,2]. Strong peaks in annihilation rate are observed at energies just below the vibrational modes of various molecules. These peaks are due to vibrational Feshbach resonances (VFR) and provide evidence of positron- molecule binding. In this paper, the properties of these VFR are further explored. The dependence on target morphology is studied for the ring hydrocarbons, benzene, cyclohexane and cyclopropane. A comparison is presented of positron-annihilation and infrared-absorption spectra. Finally, evidence is presented for a second, "positronically excited" bound state in large alkane molecules.

[1] S. J. Gilbert, et al., Phys. Rev. Lett., 88, 043201 (2002).

[2] L. D. Barnes, et al., Phys. Rev. A 67, 032706 (2003).

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