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Comparison of Positron- and Electron-Molecule Bound States[1]
J.R. DANIELSON, A.C.L. JONES, M.R. NATISIN, C.M. SURKO, University of California, San Diego — Positrons can attach to molecules via Feshbach resonances (VFR) in which a vibrational mode absorbs the excess energy. Using a high-resolution positron beam, this VFR process has been used to measure positron-molecule binding energies for many chemical species.[2,3] New measurements will be discussed of positron binding to relatively simple molecules and molecules with large permanent dipole moments (μ). For example, the binding energy is 75 meV for CS_2 ($\mu = 0$) and 180 meV for acetonitrile (CH_3CN, $\mu = 3.9$ debye). Other species studied include aldehydes, ketones, and nitriles, which have μ in the range $2.5 - 4.0$ debye. These data will be compared to analogous, weakly bound electron-molecule (negative-ion) states.[4] The positron binding energies are surprisingly large (i.e., by a factor of 10 to 100) compared to those for the analogous negative ions, and origins of these differences will be discussed.

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[2]Danielson, et. al., *J. Phys. B*, **42**, 235203 (2009).
[3]Danielson, et. al., *Phys. Rev. Lett.*, **104**, 233201 (2010).
[4]Hammer, et. al., *J. Chem. Phys.* **119**, 3650 (2003).

James Danielson
University of California, San Diego

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