Positron-molecule binding energies\footnote{Work supported by NSF grant PHY PHY 07-55809.} C.M. SURKO, J.R. DANIEL-SON, University of California, San Diego, J.A. YOUNG, Jet Propulsion Laboratory — Positron annihilation on many molecular species occurs via vibrational Feshbach resonances thus indicating that positrons bind to these molecules\footnote{J. A. Young and C. M. Surko, \textit{Phys. Rev. A} 77, 052704 and 78, 032702 (2008).}. The downshifts in these resonances from the energies of the molecular vibrational modes provide a measure of the positron-molecule binding energy, $\epsilon_b$. To date, binding energies for thirty molecular species have been measured using this technique\footnote{J. A. Young and C. M. Surko, \textit{Phys. Rev. A} 77, 052704 and 78, 032702 (2008).}. This paper describes a regression analysis of the dependence of $\epsilon_b$ on molecular parameters. A reasonably accurate model can be constructed using a weighted, linear combination of the dipole polarizability, permanent dipole moment, and the number of $\pi$ bonds for the molecule. The resulting expression is used to compare with existing theoretical predictions of $\epsilon_b$. In some cases the predictions are within a factor of two, while in others, they are off by as much as an order of magnitude. Tests of the model to predict molecules that do not bind positrons, interesting molecules for future study, and other possible parameterizations of $\epsilon_b$ will also be discussed.