

MOLECULAR ROTATION IN FLOPPY MOLECULES: HE-H₃⁺

THOMAS SALOMON, OSKAR ASVANY, *I. Physikalisches Institut, Universität zu Köln, Köln, Germany*; DIETER GERLICH, *Institut für Physik, Technische Universität Chemnitz, Chemnitz, Germany*; IGOR SAVIC, *Department of Physics, University of Novi Sad, Novi Sad, Serbia*; AD VAN DER AVOIRD, *Institute for Molecules and Materials (IMM), Radboud University Nijmegen, Nijmegen, Netherlands*; MICHAEL E. HARDING, *Institute of Nanotechnology, Karlsruhe Institute of Technology, Karlsruhe, Germany*; FILIPPO LIPPARINI, *Dipartimento di Chimica e Chimica Industriale, Università di Pisa, Pisa, Italy*; JÜRGEN GAUSS, *Institut für Physikalische Chemie, Universität Mainz, Mainz, Germany*; STEPHAN SCHLEMMER, *I. Physikalisches Institut, Universität zu Köln, Köln, Germany*.

The ro-vibrational predissociation spectrum of He-H₃⁺ has been recorded via excitation of the ν_2 vibrational mode of the H₃⁺ sub-unit in a cold 22-pole ion trap. The spectrum for the bare H₃⁺ consists of only a few ro-vibrational lines each for the para and ortho nuclear spin configuration, respectively. Instead, the spectrum of the complex is very rich (several hundred lines) even at the low temperature (4 K) of the trap experiment. Part of this complexity is associated with the (almost) free internal rotation of H₃⁺. The experimental results are compared to theoretical predictions of ro-vibrational spectra on the basis of ab-initio calculations of the He-H₃⁺ potential energy surface. The energy levels result in transitions which agree in many cases with experimental results within a few wavenumbers. In particular the typical band structures of a P- and R-branch associated with an effective *diatomic* complex seen in the experimental and predicted spectrum help in assigning the rich spectrum. Moreover, an experimental energy term diagram is reconstructed from the observed transitions which can be compared to the rather accurate theoretical predictions. Despite of the floppiness of the complex rotational constants for the effective *diatomic* complex can be derived and match to the term diagram of a prolate, slightly asymmetric rotor. The influence of the Coriolis interaction resulting from the H₃⁺ internal rotation in a rotating He-H₃⁺ frame shall be discussed.