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Abstract

The Superrotor Model for the Rovibrational Motion of CH_5^+, an Extremely Flexible Molecule †

Hanno Schmiedt [1], Stephan Schlemmer [1] and Per Jensen [2,*]

[1] I. Physikalisches Institut, Universität zu Köln, Zülpicher Straße 77, D-50937 Köln, Germany; schmiedt@ph1.uni-koeln.de (H.S.); schlemmer@ph1.uni-koeln.de (S.S.)

[2] Physikalische und Theoretische Chemie, Bergische Universitaet Wuppertal, Gauss-Strasse 20, D-42119 Wuppertal, Germany

* Correspondence: jensen@uni-wuppertal.de

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We discuss here the low-energy rotation-vibration problem in CH_5^+, an extremely flexible molecule lacking a well-defined structure. Using SO(5) symmetry we determine zeroth order energies, and complete nuclear permutation S_5 symmetries, using a five-dimensional model involving rotation and two vibrations (which one might imagine as internal rotations of a 2-proton-moiety relative to a 3-proton-moiety). These two vibrations are presumed to be unhindered by the molecular potential function and their analytical form is not determined. The other ten vibrational degrees of freedom are presumed to be "rigid" (or averaged over). The general energy expression for this "rigid superrotor" is relatively simple and contains one parameter only, the rotational constant B, together with two non-negative integers defining the irreducible representations of SO(5). The superrotor predictions agree favourably with the available experimental data.

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