DETERMINATION OF DIPOLE MOMENTS FOR MOLECULAR IONS FROM VIBRATION-ROTATIONAL SPECTRA. APPLICATION TO ArH^+ $X^1\Sigma^+$

MARCIN MOLSKI and JERZY KONARSKI, *Theoretical Chemistry Department, A. Mickiewicz University, ul. Grunwaldzka 6, PL 60-780 Poznań, Poland.*.

The conventional method for determination of dipole moment via observation of the Stark effect is difficult to apply to molecular ions because of the translational motion of net charges induced by an electric field. Laughlin *et al.*[a] have developed a method for experimental determination of the dipole moment of molecular ions by measuring the rotational $g-$factors for two different isotopomers of a given molecule. Application of this method to ArH^+ yields $\mu = 3.0(6)$ D which is not consistent with the *ab initio* value $\mu = 2.2(1)$ D of Rosmus[b] at the 2σ limits of precision. To verify these results we extended[c] the Dunham's approach to analytic treatment of vibration-rotational spectra of diatomic molecules and applied the method to ArH^+ in the ground electronic states $X^1\Sigma^+$. From the wavenumbers of the assigned pure rotational and vibration-rotational transitions we determined[d] parameters representing nonadiabatic rotational effects and then rotational $g-$factor and dipole moment of ArH^+ at equilibrium distance R_0. A comparison with the results reported by Rosmus and Laughlin *et al.* has led to unexpected conclusions[e].

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[b] P. Rosmus, Theoret. Chim. Acta, **51** 359 (1979).
[c] M. Molski, J. Phys. Chem **103** 5269 (1999).
[d] M. Molski, **306** 88 (1999).
[e] M. Molski and J. Konarski, unpublished results