THE MARVELOUS WORLD OF OH^+

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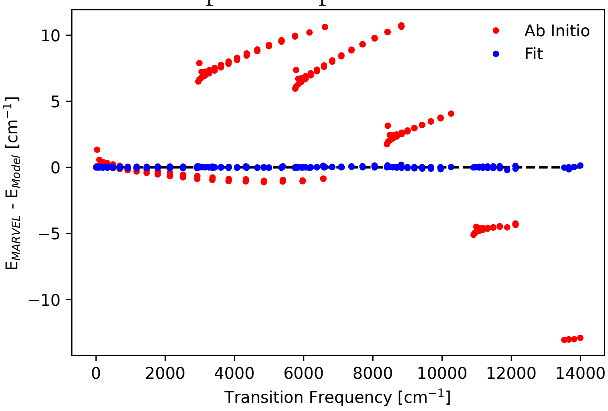
The OH^+ ion is an interesting molecular species, due to its critical intermediate in interstellar chemistry. OH^+, together with H_2O^+ and H_3O^+, is an important probe of the cosmic ray ionization rates in diffuse clouds, on the surfaces of molecular clouds. It is formed by the reaction of oxygen atoms with cosmic ray ionised H or H_2, and it goes to further reactions with other hydrogen sources to form, via multiple steps, OH[1]. It acts as an enabler of more complex reaction networks occurring in the interstellar medium[2]. The molecule is also formed in the ionosphere of Earth and comets[3].
We started by collecting transition from different experimental work[4] and processing them using MARVEL[5] for generating high level accuracy energy levels, with an uncertainty of 1×10^{-2} cm^{-1}. These energies are used in DUO[6] to fit the potential energy curve and couplings of the X $^3\Sigma$ state, leading to a new linelist with RMSE=5.43×10^{-2} cm^{-1} with respect to experimental transition energies.



The same procedure is applied to the A $^3\Pi$ state. The coupling between this state and the a $^1\Delta$, b $^1\Sigma^+$, and c $^1\Pi$, leads to a more complex situation to analyse[7]. The

[1] D. Hollenbach et al 2012 *ApJ* **754** 105
[2] A. J. Porras et al 2014 *ApJL* **781** L8
[3] R. Martinez et al 2005 *JCP* **123** 174312, P.V. Stoeva et al 2005 *Planetary and Space Science* **53** 327
[4] Rehfuss et al 1992 *JMS* **151** 59, C. R. Markus et al 2016 *ApJ* **817** 138, J. N. Hodges et al 2017 *ApJ* **840** 81
[5] T. Furtenbacher et al 2007 *JMS* **245** 115
[6] Yurchenko et al 2016 *CPC* **202** 262
[7] D. Yarkony 1993 *JPC* **97** 111

$X\,^3\Sigma$ and $A\,^3\Pi$ state curves will be used to generate a comprehensive line list for OH^+.