International Journal of Advanced Research in Physical Science (IJARPS)
Volume 7, Issue 3, 2020, PP 1-2
ISSN No. (Online) 2349-7882
www.arcjournals.org

Double Surface Characteristics of Hydrogen Sulphide

Janez Špringer*

Cankarjeva cesta 2, 9250 Gornja Radgona, Slovenia, EU

Corresponding Author:** ***Janez Špringer, *Cankarjeva cesta 2, 9250 Gornja Radgona, Slovenia, EU*

Abstract: *Hydrogen sulphide possesses the double surface characteristics as expected for a bent molecule.*

Keywords: *Unstable and stable subtle-orbit, hydrogen sulphide molecule, double-surface characteristics*

1. Introduction

Hydrogen sulphide is a bent molecule like water. The latter possesses the double-surface characteristics. [1]The aim of this article is to examine if hydrogen sulphide has the double surface characteristics, too. The bond length of SH is longer than that of the OH but the bond angle of HSH is smaller than that of the HOH.[2] On the first decimal rounded geometry of HSH is presented in Fig1:

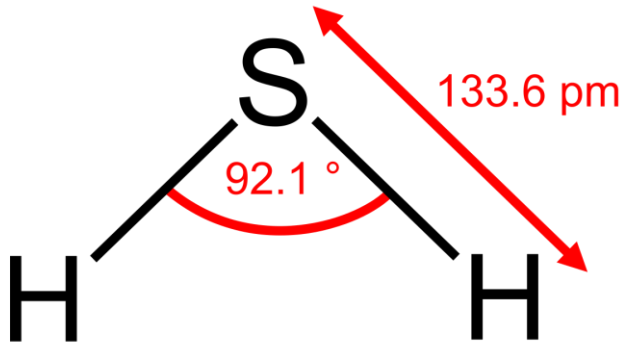

Fig1. *The geometry of Hydrogen sulphide*

2. Original, Unstable Subtle and Stable Subtle Orbit

For the credible examination of the double-surface characteristics of hydrogen sulphide the bond length SH and bond angle HSH should be known on two decimals[2]:

$$SH = 133.56\,pm. \tag{1}$$

$$HOH = 92.11°. \tag{2}$$

The HH distance is given by the cosine rule:

$$HH = SHx\sqrt{2(1-cos\varphi)} = 133.56\,pm\,x\sqrt{2(1-\cos(92.11°)} = 192.328\,081\,pm. \tag{3}$$

The measured subtle orbit is $\pi - times$ longer[1]:

$$s_{subtle}^{measured} = \pi\,x\,HH = 604.216\,486\ \ pm = 249.026\,887\,\lambda_e. \tag{4}$$

Applying the equation $s_n = n\left(1-\frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right)$ [1] the unstable subtle orbit should yield [3]:

$$s_{subtle}^{unstable} = 2\,x\,s\left(\frac{249}{2}\right) = 2\,x\,124.5\left(2-\frac{1}{\sqrt{1+\frac{\pi^2}{124.5^2}}}\right) = 249.079\,236\,\lambda_e. \tag{5}$$

And the stable subtle orbit should be[3]: $s_{subtle}^{stable} = s(249) = 249\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{249^2}}}\right) = 249.019\,816\,\lambda_e.$ (6)

So the measured subtle orbit (4) lies between the unstable (5) and stable (6) one as follows:

$$s_{subtle}^{unstable} = 249.079 > s_{subtle}^{measured} = 249.027 > s_{subtle}^{stable} = 249.020. \quad (7)$$

The hydrogen sulphide geometry thus satisfies the double-surface characteristics (7).

3. The Stable Intramolecular HH Bond in Hydrogen Sulphide

Taking into account $Ry = 13.6$ eV and $\alpha^{-1} = 137.036$ the energy released at forming a stable intramolecular HH subtle bond in Hydrogen sulphide is given by[3]:

$$\Delta E = Ry \text{ x } \alpha^{-1}\left(\frac{1}{\frac{s(249)}{2}} - \frac{1}{s(124.5)}\right) \approx 0.004\, eV. \quad (8)$$

The above energy is about twice smaller than that one proposed to be released at forming a stable intramolecular HH bond in water molecule[3].

4. Conclusion

The double-surface characteristics found for water and hydrogen sulfide should be expected for other bent molecules, i.e. H_2Se and H_2Te, too. But to prove this, their more accurate geometry should be available.

References

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Citation: *Janez Špringer, (2020). “Double Surface Characteristics of Hydrogen Sulphide". International Journal of Advanced Research in Physical Science (IJARPS) 7(3), pp.1-2, 2020.*