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Double Surface Characteristics of Methane

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Abstract: *It looks like methane molecule possesses the double surface characteristics in accordance with its tetrahedral structure.*

Keywords: *methane tetrahedral structure, common tetrahedral orbit, double-surface characteristics*

1. Introduction

The aim of this article is to examine the double-surface characteristics of methane which is known to be a perfectly symmetrical tetrahedral molecule.[1] In a tetrahedral molecular geometry, a central atom is located at the center with four substituents that are located at the corners of a tetrahedron. The bond angles HCH equal $\cos^{-1}(-1/3) = 109.4712206...° \approx 109.5°$ when all four substituents are the same, as in methane (CH_4) where the substituents are hydrogen atoms forming four CH bonds of the length yielding 108.70 pm.[1] The CH_4 geometry is presented in Fig1[2]:

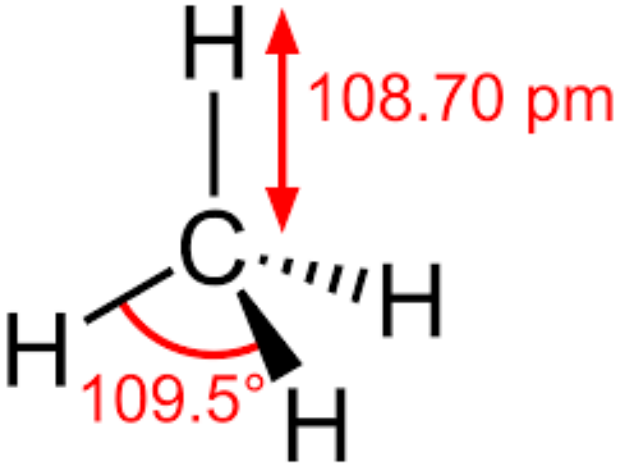

Fig1. *The geometry of methane* [2]

2. The Subtle Orbit Between Two Hydrogen Corners

The examination of the double-surface characteristics of methane should be credible since the value of bond angle HCH is exact and the bond length CH to two decimal places is given sufficiently precisely:

$$HCH = cos^{-1}\left(-\frac{1}{3}\right) = 109.471\ 220\ 6\ ...°. \quad (1)$$

$$CH = 108.70\ pm. \quad (2)$$

The HH distance is given by the cosine rule:

$$HH = CHx\sqrt{2(1-\cos HCH)} = 108.70\ pm\ x\sqrt{2\left(1+\frac{1}{3}\right)} = 177.506\ 356\ 694\ pm. \quad (3)$$

By analogy to bent molecules the measured subtle orbit between two hydrogen corners should be $\pi - times$ longer [3]:

$$s_{bent}^{measured} = \pi\, x\, HH = 557.652\,666\,154\, pm = 229.835\,681\,241\, \lambda_e\,. \quad (4)$$

The above result (4) does not provide a stable orbit which should otherwise meet the double-surface criteria[3]:

$$s_n = n\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right), n \in \mathbb{N}. \quad (5)$$

This is not a surprise since in tetrahedral molecule – not only two – but all four hydrogen corners are equally adjacent to each other as we can see in Fig2 [4]:

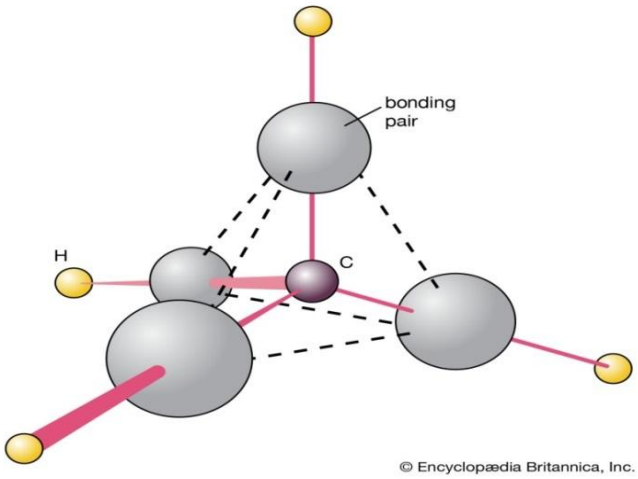

Fig2. *The tetrahedral structure of methane* [4]

3. The Tetrahedral Orbit between Four Hydrogen Corners

Let us propose a subtle orbit between all four hydrogen corners in the methane molecule. The projection of electron path of such a common tetrahedral orbit is presented in Fig3 [5].

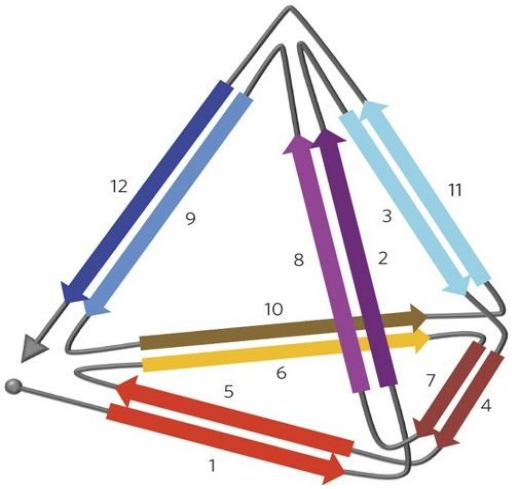

Fig3. *The projection of tetrahedral electron pathway between hydrogen corners of the methane molecule* [5]

We can see that the length of a common tetrahedral path should be $12 - times$ longer than the distance between two hydrogen corners (4). Twelve HH distances should be passed by the electron on its round way from the starting to the final – again starting position. Note (4) that the real path is $\pi - times$ longer than the projection shown in Fig3:

$$s_{tetrahedral}^{measured} = s_{bent}^{measured}\, x\, 12 = 2758.028\, \lambda_e \approx s_{2758} = 2758.002\, \lambda_e. \quad (5)$$

The given common tetrahedral orbit satisfies the double surface characteristics (5). A little shorter CH bond length, for instance of 108.699 pm, would offer the accordance to the third decimal.

4. CONCLUSION

Proposed common molecular tetrahedral orbit length of methane explains the double-surface characteristics of methane molecule. Thus [5]:

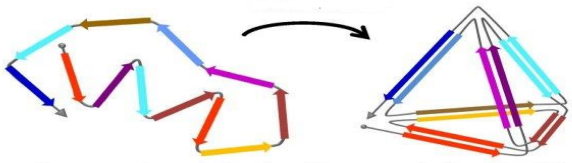

Fig4. *Forming molecular tetrahedral orbit of methane*

DEDICATION

This fragment is dedicated to judiciousness

APPENDIX

The double-surface characteristics found for methane should be expected for other tetrahedral molecules, too. Enough accurate geometry to prove it is available for SiH_4 and GeH_4. From the bond length SiH = 147.98 pm and GeH = 152.51 pm follows a tetrahedral path consisting of 9 and 15 HH distances, respectively.

REFERENCES

[1] https://en.wikipedia.org/wiki/Tetrahedral_molecular_geometry. Retrieved February 2020

[2] https://mathoverflow.net/questions/219889/positions-of-a-methane-molecule-with-carbon-atom-at-the-origin. Retrieved February 2020

[3] Janez Špringer, (2020).Stable Intra Molecule Connection of Hydrogen Atoms in Water Molecule" . International Journal of Advanced Research in Physical Science (IJARPS) 7(2), pp.21-22, 2020

[4] https://www.britannica.com/science/methane. Retrieved February 2020

[5] http://2015.igem.org/Team:Warwick/modelling3. Retrieved February 2020

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