International Journal of Advanced Research in Physical Science (IJARPS)
Volume 7, Issue 3, 2020, PP 50-51
ISSN No. (Online) 2349-7882
www.arcjournals.org

Double Surface Characteristics of Xenon Difluoride

Janez Špringer*

Cankarjeva cesta 2, 9250 Gornja Radgona, Slovenia, EU

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

Abstract: *It looks like Xenon difluoride as a linear molecule possesses the double surface characteristics.*

Keywords: *linear molecule, Xenon difluoride, subtle orbit, double-surface characteristics*

1. Introduction

Bent molecules like water and hydrogen sulphide possess the double-surface characteristics.[1] The aim of this article is to extend the theory to other triatomic molecules. Interesting is linear molecular geometry of Xenon difluoride (XeF_2), meaning the bond angle F-Xe-F equals 180 degrees (2 x 90° = 180°) as can be seen in Fig1 [2]:

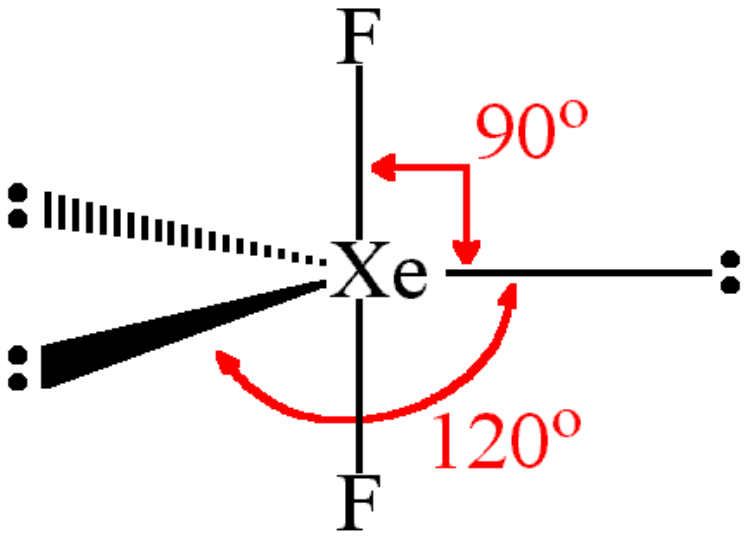

Fig1. *The geometry of Xenone difluoride* [2]

The bond length of xenon difluoride depends on the aggregate state. The most reliable value for the Xe-F bond length in the vapour phase is 197.73±0.15 pm. [3] On the other hand the neutron diffraction study of the solid XeF_2 gave the value of 200 pm for the bond length of Xe-F. [4]

2. The Subtle Orbit between two Fluoride Atoms

The examination of the double-surface characteristics of xenon difluoride should take into account the different Xe-F bond lengths in vapour and solid state.

2.1. The Subtle Orbit in Vapour State

We should apply the data for vapour state [3].

The FF distance is twice Xe-F bond length:

$$FF = 2\ x\ XeF = \ 2\ x\ 197.73\ pm = 395.46\ pm. \quad (1)$$

By analogy to bent molecules the measured subtle orbit between F atoms is $\pi - times$ longer [3]:

$$s_{vapour}^{measured} = \pi\ x\ FF = 1242.37\ pm\ = 512.04\ \lambda_e \approx s_{512} = 512.01\ldots\lambda_e. \quad (2)$$

What meets the double-surface criteria (3) for n = 512:

$$s_n = n\left(2 - \frac{1}{\sqrt{1+\frac{\pi^2}{n^2}}}\right), n \in \mathbb{N}. \quad (3)$$

2.2. The Subtle Orbit in Solid State

We should apply the data for solid state [4].

The FF distance is twice Xe-F bond length:

$$FF = 2\ x\ XeF\ = 2\ x\ 200\ pm = 400\ pm. \quad (4)$$

The measured subtle orbit between F atoms is $\pi - times$ longer:

$$s_{solid}^{measured} = \pi\ x\ FF = 1256.34\ pm\ = 517.92\ \lambda_e \approx s_{518} = 518.01\ldots\lambda_e. \quad (5)$$

What meets the double-surface criteria (3) for n = 518 but the statement is less credible than that one previously made for vapour state (section 2.1) since the Xe-F bond length in solid state is given less precisely.

2.3. The Subtle Orbit in Liquid State

The subtle orbit length in liquid state is proposed to be quantized and could be given by the interpolation knowing $T_{boling\ point} = 155°C$ and $T_{melting\ point} = 128.6°C$ as follows:

$$s_{liquid}^{measured} = s_{518} - \frac{s_{518}-s_{512}}{155℃-128.6℃}(T_{liquid} - 128.6℃) \approx s_n. \quad (6)$$

3. Conclusion

Double surface characteristics are expected for linear molecules. For Xenon difluoride are partly calculated and partly guessed.

Dedication

This fragment is dedicated to my dear sister Darinka on the occasion of her 72nd birthday. For noble nature and straightforward character

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Citation: *Janez Špringer, (2020). “Double Surface Characteristics of Xenon Difluoride ". International Journal of Advanced Research in Physical Science (IJARPS) 7(3), pp.50-51, 2020.*