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Nobility of Helium in the Light of Double Surface Concept

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Abstract: *The common electron pentagon orbit in Helium atom exhibits the double surface characteristics.*

Keywords: *Helium atom, pentagon orbit and five-pointed star projection, double surface characteristics of common orbit*

1. Introduction

The subject of interest of this paper is to examine the double surface characteristics of Helium atom.

2. Bohr-like Orbit

On Bohr orbit [1] the electron circulates around a nucleus consisting of only one proton. On Bohr-like orbit the electron circulates around nucleus with more than one proton what shortens the orbit length. The ratio of both orbit lengths equals the effective nuclear charge which takes into account the shielding effect committed by neighbouring electrons, too. Expressing the orbit length in Compton wavelengths of the electron we have[1]:

$$s_{Bohr-like} = \frac{\alpha^{-1}}{Z_{effective}}. \tag{1}$$

Where α^{-1} denotes the inverse fine structure constant and $Z_{effective}$ denotes the effective nuclear charge.

3. The Double Surface Orbit

Respecting the double surface concept [1] the length of the Bohr-like orbit is the average elliptic-hyperbolic length s expressed by the elliptic length n of that orbit as follows:

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

The elliptic length n being the natural number is at the same time the Bohr-like orbit name.

4. Bohr-Like Orbit In Helium Atom

Knowing the value of the effective nuclear charge of Helium $z^{He}_{effective} = 1.6875$ [1] as well as the inverse fine structure constant $\alpha^{-1} = 137.0360$ Bohr-like orbit of Helium atom can be calculated applying the equation (1):

$$s_{He} = 81.206\,52. \tag{3}$$

Applying the equation (2) a similar double-surface length of that orbit is given:

$$s_{81} = 81.060\,85. \tag{4}$$

But perhaps it is not similar enough.

5. The Common Orbit in Helium Atom

Let us find more favourable double surface characteristics of Helium atom in a common orbit being some multiple of Bohr-like orbit $s_{He} = 81.206\,52$. Such value is, for instance, five times the above number (3):

$$5\ x\ s_{He} = 406.032\ 59 \approx s_{406} = 406.012\ 15. \quad (5)$$

Buying the already mentionated conclusion the pentagon road of both electrons including with its star projection in Helium atom can be proposed as presented in Figure1.

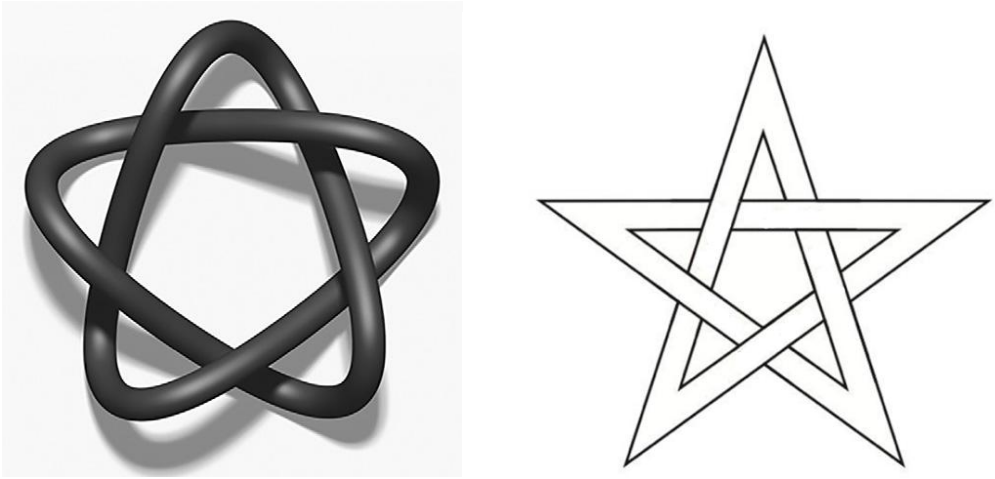

Fig1. *Proposed pentagon road and its star projection in Helium atom*

6. CONCLUSION

Due to more dispersed electronic arrangement the proposed pentagon (or five-pointed star) road in Helium atom contributes to nobility of Helium.

DEDICATION

This fragment was written during the coronavirus pandemic. So it is dedicated to Nobility of staying home.

Fig2. *Staying home*

REFERENCES

[1] Špringer J. Conceptual Helium Atom Radius, International Journal of Advanced Research in Physical Science (IJARPS), Volume 4, Issue 2, February 2017, 13-16.

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