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Adjusted Upper Limit in Mendeleev's Periodic Table (Flirting of the Micro and Macro world)

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Abstract: *The adjusted upper limit in Mendeleev's periodic table is presented.*

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1. Introduction

In the previous paper [1], taking into account the characteristics of the micro world, the 164th element Unhexquadium as the upper limit in Mendeleev's periodic table was predicted. In this paper the 155th element Khazanium as the upper limit, obtained regarding the characteristics of the macro world, [2] will be considered. Both possible upper limits are presented in Table1.

Table1. *Possible upper limits of Mendeleev's periodic table related to the amount of 1s effective nuclear charge* $Z_{effective}$

	Atom number	$Z_{effective}$
Hydrogen (H)	1	1
Classical upper limit Lead (Pb)	**82**	**80.4195**
	(82.4)	80.7669
Bismuth (Bi)	83	81.3982
Adjusted non-classical upper limit Khazanium (Kh)	**155**	**151.8575**
156th	156	152.8361
Non-classical upper limit Unhexquadium (Uhq)	**164**	**160.6649**
	(164.9)	161.5338
165th	165	161.6435

2. The Classical Approach

From classical perspective the effective nuclear charge $Z_{effective}$ with the help of inverse fine structure constant α^{-1} determines the electron orbit length s_{orbit} expressed in Compton wavelengths of the electron in any atom as follows [1]:

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

On the other hand, respecting the double-surface geometry the electron orbit length cannot be less than one average elliptic-hyperbolic unit long [1]:

$$s_{minimum} = s(1) = 2 - \frac{1}{\sqrt{1+\pi^2}} = 1{,}696\,685\,5\,... \tag{2}$$

So, the next maximum effective nuclear charge should be allowed [1]:

$$Z_{effective}^{maximum} = \frac{\alpha^{-1}}{s(1)} = 80.7669. \tag{3}$$

With a consequence that the 81th element Lead with the effective nuclear charge $Z_{effective}^{Pb} = 80.4195$ would represent the last element in the Mendeleev's periodic table and the 82th element Bismuth with the effective nuclear charge $Z_{effective}^{Bi} = 81.3982$ would not be allowed. (See Table1)

Because Lead is the last element which satisfies the rule:

$$Z_{effective}^{Pb} = 80.4195 < Z_{effective}^{maximum} = 80.7669. \tag{4}$$

But Bismuth is the first element which does not do it:

$$Z_{effective}^{maximum} = 80.7669 < Z_{effective}^{Bi} = 81.3982. \tag{5}$$

The existence of Bismuth, of course, denies the classical approach.

3. THE NON-CLASSICAL APPROACH

From non-classical perspective the effective nuclear charge $Z_{effective}$ with the help of double inverse fine structure constant $2\alpha^{-1}$ determines the electron original orbit length $s_{original}$ expressed in Compton wavelengths of the electron in any atom as follows [1]:

$$s_{original} = \frac{2\alpha^{-1}}{Z_{effective}}. \tag{6}$$

So, the next maximum effective nuclear charge should be allowed [1]:

$$Z_{effective}^{maximum} = \frac{2\alpha^{-1}}{s(1)} = 161.5338. \tag{7}$$

With a consequence that the 164th element Unhexquadium with the effective nuclear charge $Z_{effective}^{Uhq} = 160.6649$ would represent the last element in the Mendeleev's periodic table and the 165th element with the effective nuclear charge $Z_{effective}^{165} = 161.6435$ would not be possible (See Table1) because

$$Z_{effective}^{Uhq} = 160.6649 < Z_{effective}^{maximum} = 161.5338 < Z_{effective}^{165} = 161.6435. \tag{8}$$

The Khazan's theory predicting 155th element, denoted Khazanium (Kh), as the upper limit in Mendeleev's periodic table, [2] calls for adjustment of the non-classical approach. (See Table1)

To meet the needs of micro and macro world the adjustment should be done.

4. THE ADJUSTMENT OF NON-CLASSICAL APPROACH

From adjusted non-classical perspective the effective nuclear charge $Z_{effective}$ with the help of adjustment coefficient K and inverse fine structure constant α^{-1} determines the electron original orbit length $s_{original}$ expressed in Compton wavelengths of the electron in any atom as follows:

$$s_{original} = \frac{K\alpha^{-1}}{Z_{effective}}. \tag{9}$$

So, at known maximum effective nuclear charge being equal that one of Khazanium $Z_{effective}^{maximum} = Z_{effective}^{Kh} = 151.8575$ [2] the next adjustment coefficient K is given:

$$K = \frac{Z_{effective}^{maximum} s(1)}{\alpha^{-1}} = \frac{151.8575\ x\ 1{,}696\ 685\ 5}{137.0360} = 1{,}8802. \tag{10}$$

The adjustment coefficient K lies between numbers 1 and 2:

$$1 < K < 2. \tag{11}$$

The value $K = 1$ would mean that the kinetic energy of the electron in atom remains preserved. The value $K = 2$ would mean that all kinetic energy of the electron in atom is transformed to the distribution energy. The value $K = 1.8802$ means that only **0.8802** part of the kinetic energy of the electron is transformed to the distribution energy but **0.1198** part of the kinetic energy of the electron remains preserved. The preserved part $\Delta_{preserved}$ of the kinetic energy of the electron on 1s orbit of Khazanium is then the next:

$$\Delta_{preserved} = 2 - K = 2 - 1.8802 = 0.1198. \tag{12}$$

Generalization of the statement to all atoms offers the calculation of the preserved kinetic energy of the electron on 1s orbit of any atom:

$$W_{preserved} = \Delta_{preserved} W_{kinetic} = \Delta_{preserved}\, Z_{effective}\, Rydberg. \tag{13}$$

For instance, in the ground state of Hydrogen atom with $Z^{H}_{effective} = 1$ [1] the preserved kinetic energy of the electron is the next:

$$W^{H}_{preserved} = 0.1198\, x\, 1\, x\, 13.6057 \text{ eV} = 1.63 \text{ eV}. \tag{14}$$

Interestingly, the range of photon energies for visible light from red to violet is 1.63 to 2 x 1.63 eV. [3] These photons can be absorbed by atoms and molecules because their energies are on the order of those between outer electron shells in atoms and molecules. This could mean that the preserved part $\Delta_{preserved}$ of the kinetic energy of the electron could play a role of the electron character in any atom or molecule orbit.

5. Conclusion

Let endless hope bless the limit

Dedication

To endless hope [4]

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