

# Isotopes and the Electron Configuration of the Blocks in the Periodic Table of Elements, upto the Last Element No.155

Albert Khazan

E-mail: albkhazan@gmail.com

This is a theoretical study, which first manifests which connexion exists between isotopes and the electron blocks, and how the electron blocks are located in the version of the Periodic Table of Elements which ends with element No.155.

## 1 Introduction

It is known that elements of the Periodic Table of Elements have fractional numerical values of atomic masses. This is because the elements consists of, as regularly, a mix of in-born (native) isotopes. For this reason we conclude that the average weighted atomic mass of all stable isotopes of any element (taking their distribution in the Earth crust) is that atomic mass which is used in all calculations. Because it is equal to the sum of the electric charge of an atomic nucleus and the number of neutrons in it, the isotopes are determined by the condition  $A = Z + N$ , where  $A$  is the atomic mass,  $Z$  is the charge,  $N$  is the number of neutrons of the nucleus. With all these, it is necessary to keep in mind that, having the same number of protons in a nucleus, the nucleus may contain different number of neutrons which do not change the chemical properties of the atoms: all isotopes of the same element bear the same electric charge of its nucleus, but change only with the number of neutrons in it.

## 2 Calculation according to the table of isotopes

According to the data provided by *Nuclear Periodic Table* [1], all spectacularity of the data was split into blocks, wherein the number of isotopes was determined, namely: 431 (s), 1277 (p), 1612 (d), 1147 (f). As is seen in Fig. 1, the obtained results form a smooth arc with  $R^2 = 1$ . Because all the isotopes are grouped into clocks of the electron configuration alike elements of the Periodic Table, we are lawful to conclude that the *same law* lies in the ground of the geometric configurations. It is necessary to note that, with reaching the top of the arc, the number of the isotopes very lowers, that was as well observed in the case of elements of the Periodic Table [2].

## 3 Version of the Periodic Table of Elements, which limits by element No.155

It is known that the “blocks” of the Periodic Table of Elements are sets of adjacent groups [3, 4]. The names of the blocks originate in the number of the spectroscopic lines of the atomic orbitales in each of them: sharp, **p** principal, **d** diffuse, **f** fundamental. During the last decades, one suggested to extend the Periodic Table upto 218 elements, with appearance a **g**-block in it [5]. If, in the version of the Periodic Table consisting of only 118 elements, the blocks draw a smooth

arc with  $R^2 = 1$  (see Fig. 2), the appearance of additional elements in the Table requires new construction of the blocks, which should be set up in another configuration.

Earleir [5], we suggested a version of the Periodic Table which contained Period 8 with 37 elements (two lines with 18 and 1 elements in Group 1). In this form, the Periodic Table satisfies the common structure of the location of the elements. However, once lanthanides and actinides have been extended into a common scheme, the heaviest element No.155 (which ends the Table in this its version) became shifted for 4 positions to right. Therefore, a question rose: how to locate these 37 elements in the new version of the Table so that they would completely satisfy all the rules of the electron configuration of the blocks?

First, we added 2 elements to block **s** upto the begining of Period 8. Then we added 6, 10, and 14 elements (respectively) to blocks **p**, **d**, **f**. Concerning the rest 4 elements, we created a new block **g**. All these changes are shown in Fig. 2 (the upper arc). As is seen, the arc has the same form as the lower arc, and shows that fact that the number of elements of the last block reaches the actual limit.

On the basis of that has been said above, a long-period form of the Periodic Table of Elements was constructed by the Author (see Fig. 3). It differs from the hypothetical forms of the Periodic Table by the real data consisting our Table. Element No.155 is the last (heaviest) in our version of the Table, thus this element “closes” the Table. Element No.155 also opens and closes Period 9, being located in Group 1 of this Period.

This scheme of calculation is applicable to all Tables of Elements containing more than 118 elements. The necessity of our study, presented herein, and the suggested version of the Table which limits by element No.155, is due to that fact the law of hyperbolas we used previously in the Periodic Table [5] provided not only the possibility to calculate the upper limit of the Table (element No.155 and its parameters such as atomic mass 411.66), but also allowed to determine its location in the extended version of the Table of Elements.

If earlier the theoretical physical chemists discussed the possibility to add a number of elements over 118 to the Table of Elements (they suggested to do it as new blocks they referred to as superactinide series, eka-superactinide, Ubb-series, Usb-series), we now obviously see that this step is non-

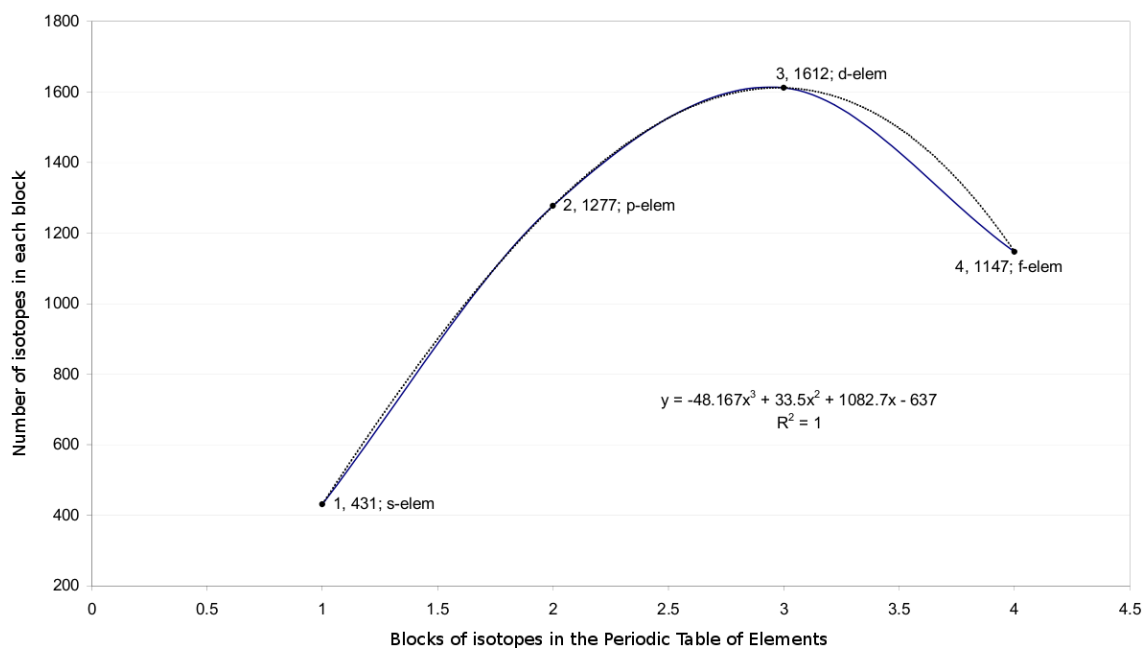


Fig. 1: Dependency of the number of the isotopes in the blocks from their names according to the elements of the electron configuration.

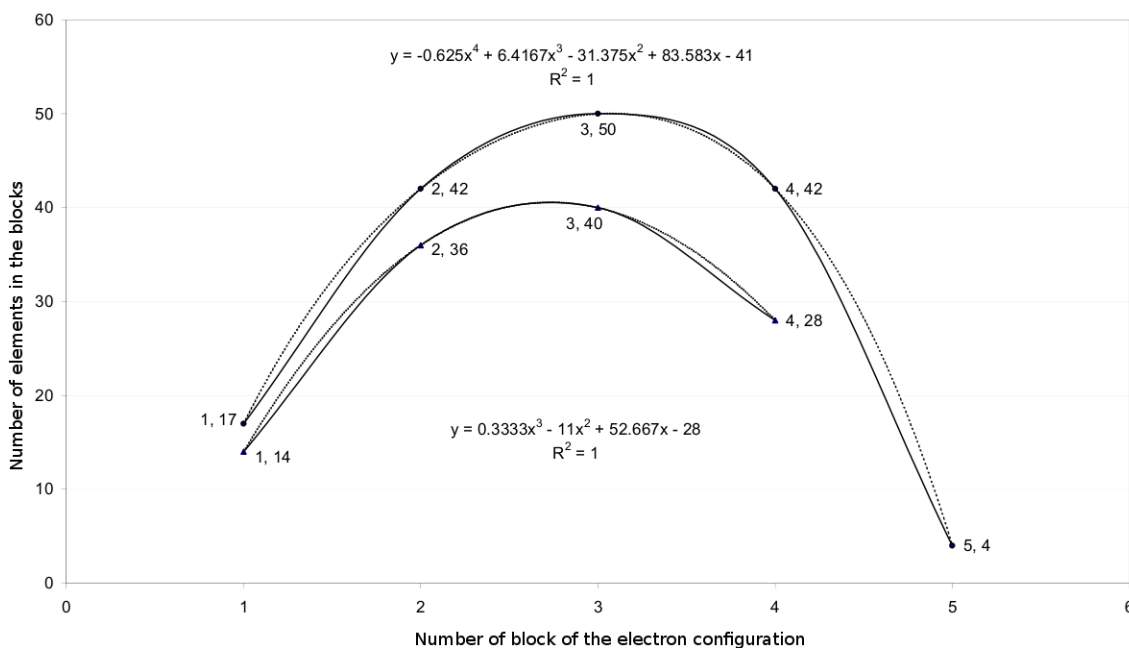


Fig. 2: Results of calculation of the electron configuration of the elements. The lower arc has been calculated for the version of the Periodic Table containing 118 elements. The upper arc has been calculated for the version of the Periodic Table containing 155 elements (suggested by the Author [5]).

1	2																																		
3	4																	5	6	7	8	9	10												
11	12															13	14	15	16	17	18														
19	20											21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36								
37	38									39	40	41	42	43	44	45	46	47	48	49	50	52	52	53	54										
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86				
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118				
119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
155																																			
<b>s-block</b>	<b>g-block</b>	<b>f-block</b>														<b>d-block</b>										<b>p-block</b>									

Fig. 3: Periodic Table of Elements, which is limited by element No.155 (suggested by the Author).

sense. Despite the bulky mathematical apparatus of Quantum Mechanics was applied to calculation of stability of the elements, it never led to a result about a limit of the Periodic Table of Elements. This was never claimed in the basis of the quantum mechanical calculations. This is because that the conditions of micro-scales, where the laws of Quantum Mechanics work, do not provide the necessary data for the calculation. Only common consideration of the conditions of micro-world and macro-world, as the author did in the recent study [5], allowed to develop the fundamental law of hyperbolas in the Periodic Table of Elements, which starts from the positions of macro-scale then continues upto the electron configuration of the elements (wherein it works properly as well, as we seen in this paper) that led to that final version of the Periodic Table of Elements, which has been presented in this paper.

Submitted on February 29, 2011 / Accepted on April 04, 2011

## References

1. Nuclear Periodic Table from the Radiochemistry Society, <http://www.radiochemistry.org/periodictable/NuclearPeriodicTable.html>
2. Khazan A. Electron configuration and element No.155 of the Periodic Table of Elements. *Progress in Physics*, 2011, v.2, 39–43.
3. Janet C. La Classification Hélicoïdale des Éléments Chimiques. Beauvais: Imprimerie Départementale de l'Oise, 1928.
4. Casson L. Notice biographique sur la vie et de l'oeuvre de Charles Janet. *Bull. Soc. Acad. de l'Oise*, Beauvais, 2008, 232.
5. Khazan A. Upper Limit in Mendeleev's Periodic Table — Element No.155. Svenska fysikarkivet, Stockholm, 2010.