HYPOTHETICAL STRUCTURE OF ATOM NUCLEI AND NATURE OF CHEMICAL ELEMENTS TOXICITY

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Abstract: *we propose to consider hypothetic general cubic structure of atom nuclei. This nuclear structure model represents 27 elementary cubes composing a large cube. In the cube integers ranging from 1 to 8 with their sum equal to 9 are arranged in such a way that by projecting them on three mutual perpendicular planes of the cube, we obtain 3 x 3 matrices. The nuclear structure is proposed to be characterized by using the information coefficients of proportionality (I_p) calculated for the matrices. If the I_p values for the projections on two mutual perpendicular faces of the cube are equal, the state of atom nucleus structure in many cases corresponds to a chemical element's isotope and is named isotope state. The third projection of the integers, which is perpendicular to the first two, corresponds to the number combination for another chemical element. The third projection determines the nuclear affinity for the chemical element of the same name. The value of nuclear affinity of a chemical element for another one is proposed to be determined by the number of corresponding isotope states obtained as the result of random sorting of general nuclear cubic structure integers. We researched of all isotope states associated with radioactive elements, which do not occur in nature. These states can probably influence the progress of chemical reactions. This property is proposed to be named as the uncertainty of nuclear affinity, which is assumed to be associated with chemical elements toxicity.*

Keywords: *computer simulation, structure of atom nuclei, toxicity of chemical elements.*

ГИПОТЕТИЧЕСКАЯ СТРУКТУРА АТОМНОГО ЯДРА И ПРИРОДА ТОКСИЧНОСТИ ХИМИЧЕСКИХ ЭЛЕМЕНТОВ

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Аннотация: *мы предлагаем гипотетическую общую кубическую структуру ядер атомов. Эта модель структуры ядер представляет собой 27 элементарных кубов, составляющих большой куб. В кубе располагаются целые числа от 1 до 8, сумма которых равна 9, при их проецировании на три взаимно перпендикулярные плоскости получаем матрицы 3x3. Структуру атомных ядер предлагается характеризовать информационными коэффициентами пропорциональности (I_p), рассчитанными для таких матриц. Если значения I_p для двух проекций на взаимно перпендикулярные плоскости куба равны, структура атомного ядра во многих случаях соответствует изотопу химического элемента и названа изотопной. Третья проекция с целыми числами, перпендикулярная двум другим, соответствует комбинации чисел для другого элемента. Такая проекция определяет ядерное сродство к этому химическому элементу. Величину ядерного сродства химического элемента к другому элементу предложено определять числом соответствующих изотопных состояний, полученных как результат случайного перемещения целых чисел общей кубической структуры. Мы исследовали все изотопные состояния, связанные с радиоактивными химическими элементами, которые не встречаются в природе. Такие состояния могут, предположительно, влиять на протекание химических реакций. Это свойство предложено назвать неопределенностью ядерного сродства. Оно, предположительно, связано с токсичностью химических элементов.*

Ключевые слова: *компьютерное моделирование, структура ядра атома, токсичность химических элементов.*

INTRODUCTION

The model of hypothetical general cubic structure of atom nuclei consists of 27 elementary cubes (3x3x3), each composed of integers ranging from 1 to 8, with their sum equal to 9. If the information coefficients of proportionality calculated using information theory formulas [1] for the integers' projections on any two mutually perpendicular faces of the large cube are equal, we assume that the nuclear structure model in many cases corresponds to a chemical element's isotope. These spatial combinations are named isotope states [2].

The third projection of the integers, which is perpendicular to the first two, corresponds to the number combination of another chemical element. The third projection determines the nuclear affinity for the chemical element of the same name and appears, for example, in natural association of certain chemical elements.

Some new results of the simulation with the use of Mersenne Twister 19937 random number generator are obtained. The nuclear affinity uncertainty of chemical elements is proposed to be defined on the basis of the population of their isotope states for radioactive chemical elements with atomic numbers exceeding 95, which presumably do not occur in nature. The uncertainty is associated with the property of toxicity and can be calculated using the sum of the relative frequencies of isotope states with respect to these radioactive chemical elements.

Toxicity of a chemical element appears as its negative impact on health. It related to both heavy and light chemical elements, metal and non-metal ones. It is a receptor theory that gives explanation to drug behavior as well as toxicity of some chemical elements and compounds. Besides, chemical elements and chemical compounds often act on cells unselectively while causing toxic effects with their own presence only. There is neither a theory of nonspecific toxicity nor of its overall quantitative estimation. We propose to consider hypothetic general cubic structure of atom nuclei as a base for the toxicity phenomenon.

The nuclear structure is proposed to be characterized by using the information coefficients of proportionality (I_p) calculated for 3 x 3 matrices with integer elements ranging from 1 to 8, with their sum equal to 9. It is determined that there exist only 120 various information coefficients of proportionality values from 0 to 1.098612, which can be calculated on the basis of the matrices [2].

This nuclear structure model represents 27 elementary cubes composing a large cube. In the cube integers ranging from 1 to 8 are arranged in such a way that by projecting them on three mutual perpendicular planes of the cube, we obtain 3 x 3 matrices described above. The structure is proposed to be named as general cubic structure.

"Atomic Weights", an open-source computer program can be used for the computations. If the Ip values for the projections on two mutual perpendicular faces of the cube are equal, the state of atom nucleus structure in many cases corresponds to a chemical element's isotope and is named isotope state [2]. This

is a basic, dominating, yet not the only, type of the nuclear structure that determines the isotope existence.

There were not found any isotope states of the atom nuclei of ytterbium, tantalum, rhenium, osmium, platinum, bismuth, polonium, astatine, radon, thorium, protactinium, uranium, plutonium, americium, curium, berkelium and all chemical elements starting with fermium. The isotope states of atom nuclei contribute to the spatial association of the corresponding chemical elements. It appears as the property of their being together in nature, which is proposed to be named as nuclear affinity [2]. The given property can be evident in the existence of many chemical elements in native forms that can be explained by the natural nuclear affinity of a chemical element for itself in accordance with the given nuclear structure. Chemical elements, found in nature in the form of nuggets, show nuclear affinity for a small number of elements.

The value of nuclear affinity of a chemical element for another one is proposed to be determined by the number of corresponding isotope states obtained as the result of random sorting of general nuclear cubic structure integers.

COMPUTER SIMULATION RESULTS

The new results of the calculations of isotope states of chemical elements' atom nuclei and their occurrence frequency at random selection of all possible states, with the help of Mersenne Twister 19937 random number generator. From 4.3 million to 6.6 billion random spatial combinations of the integers are generated for every chemical element.

The value of nuclear affinity of a chemical element for another one is also proposed to be estimated by the relative frequency of respective isotope states occurrence. For example, the nuclear affinity of sodium for itself can be calculated as (4000x2)/(4000x3) according to the data in Table 1. The nuclear affinity of sodium for uranium is equal to (4000x1)/(4000x3).

Based on the frequencies it is possible to calculate relative frequencies of isotope states as the nuclear affinity values. If the nuclear affinity of a chemical element for itself exceeds 0.6667, it indicates that there is possibly a general nuclear cubic structure, which in all three mutually perpendicular faces of a large cube, gives projections of integers characterizing only this chemical element.

Table 1. Frequencies for the tripled number of isotope states of elements (given in bold)

Element relative frequencies of the tripled number of isotope states (nuclear affinity value)											
0	H	He	Li	Be	B	C	N	O	F	Ne	Na
0.6686	0.0042	0.0031	0.0052	0.0011	0.0053	0.0056	0.0046	0.0039	0.0045	0.0090	0.0058
Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V

0.0029	0.0006	0.0008	0.0037	0.0149	0.0055	0.0030	0.0043	0.0115	0.0050	0.0036	0.0084
Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Kr
0.0040	0.0012	0.0045	0.0011	0.0245	0.0003	0.0057	0.0024	0.0026	0.0057	0.0079	0.0059
Rb	Y	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn
0.0065	0.0013	0.0413	0.0047	0.0033	0.0003	0.0019	0.0090	0.0062	0.0006	0.0068	0.0005
Sb	Te	Xe	Cs	Ba	La	Ce	Pr	Pm	Sm	Eu	Gd
0.0008	0.0025	0.0042	0.0064	0.0006	0.0029	0.0017	0.0020	0.0004	0.0001	0.0107	0.0019
Tb	Dy	Ho	Er	Tm	Lu	Hf	W	Ir	Au	Tl	Pb
0.0030	0.0002	0.0018	0.0012	0.0021	0.0049	0.0003	0.0013	0.0005	0.0017	0.0009	0.0011
Po	Fr	Ra	Ac	Np	Cf	Es	No	Db	119		
>0	0.0025	0.0063	0.0004	0.0019	0.0017	0.0007	0.0001	>0	>0		
H	Si	Ge	Ir	U	Bh						
0.6667	0.1766	0.0059	0.0036	0.0960	0.0513						
He	Al	Ge	Sm	Ir	Fm	Bh	Ts				
0.7284	0.0331	0.0721	0.0579	0.0319	0.0038	0.0718	0.0010				
0	He	**Li**	Al	Cr	Mn	Ge	Kr	W	Ir	Au	Pu
0.0150	0.0252	0.6667	0.0255	0.0843	0.0101	0.0173	0.0562	0.0219	0.0262	0.0067	0.0039
Es	No	Bh	Rg	Nh	Fl	Og					
0.0012	0.0137	0.0248	0.0006	0.0004	0.0002	0.0003					
Be	Ho										
0.8728	0.1272										
B	Si	Mn	U	No							
0.6667	0.2033	0.0110	0.0689	0.0501							
C	Kr	W	Es	No	Nh	Fl	Og				
0.6667	0.1221	0.0078	0.0055	0.1941	0.0004	0.0009	0.0025				
Be	**N**	Na	Si	Ca	Ru	Sb	Ho	Yb	At	U	Sg
0.0773	0.6667	0.0332	0.0533	0.0942	0.0204	0.0008	0.0391	0.0013	0.0003	0.0128	0.0006
Mt											
>0											
O	Si	Mo	Ir	Bi	U	Rf	Ds	Mc			
0.6667	0.2105	0.0046	0.0017	0.0060	0.1082	0.0008	0.0013	0.0003			
0	Be	**F**	Mg	Cr	Mn	Rb	Cs	Dy	Ho	Re	Hs
0.0094	0.1183	0.6667	0.0377	0.0408	0.0145	0.0177	0.0139	0.0097	0.0689	0.0020	0.0004
0	He	**Ne**	Sc	Mn	Cu	Ge	Kr	Mo	Er	Ir	Bi
0.0536	0.0342	0.6667	0.0333	0.0421	0.0350	0.0029	0.0159	0.0045	0.0237	0.0182	0.0028
Bk	No	Rf	Db	Bh	Ds	Mc	Ts	119			
0.0003	0.0431	0.0002	0.0002	0.0221	0.0006	0.0002	0.0004	>0			
Na	U										
0.6667	0.3333										
0	**Mg**	Mn	Kr	Au	Am	No	Fl				
0.0093	0.6667	0.0581	0.1407	0.0058	0.0064	0.1074	0.0057				
He	**Al**	Ge	Bh								
0.1691	0.6667	0.0873	0.0770								
Na	**Si**	Ru	Yb	U	Sg						
0.1258	0.6780	0.1262	0.0259	0.0359	0.0082						
Si	**P**	In	Pb	U	Lr	Hs					
0.1923	0.6667	0.0161	0.0042	0.1202	0.0004	0.0003					
Si	**P**	In	Pb	U	Lr	Hs					
0.1923	0.6667	0.0161	0.0042	0.1202	0.0004	0.0003					
He	Be	F	Al	**S**	Ca	Sc	Cu	Ge	He	Be	F
0.0164	0.0668	0.0157	0.0063	0.6667	0.0453	0.0384	0.0052	0.0165	0.0164	0.0668	0.0157
Kr	Mo	Te	Ce	Pr	Sm	Ho	Er	W	Kr	Mo	Te

0.0070	0.0294	0.0096	0.0013	0.0001	0.0069	0.0437	0.0056	0.0012	0.0070	0.0294	0.0096
Ir	Au	At	Ac	Pu	Am	Es	Fm	Bh	Ir	Au	At
0.0078	0.0002	0.0008	0.0006	0.0004	0.0003	0.0002	0.0002	0.0068	0.0078	0.0002	0.0008
Mt	Fl	Lv	Ts	Og							
0.0002	0.0002	>0	>0	>0							
Si	**Cl**	U	Am	Fl							
0.0140	0.6667	0.3116	0.0052	0.0026							
0	**Ar**	Mn	Kr	Nb	Sb	At	No	Mt	Rg	Nh	Lv
0.1176	0.6667	0.0926	0.0470	0.0129	0.0121	0.0070	0.0371	0.0022	0.0014	0.0015	0.0003
Og											
0.0017											
Si	**K**	U	Bk								
0.1353	0.6667	0.1962	0.0019								
He	Li	Be	S	Ar	**Ca**	Co	Ni	Ge	Se	Y	Nb
0.0049	0.0184	0.0760	0.0078	0.0117	0.6667	0.0177	0.0354	0.0052	0.0079	0.0032	0.0121
Ag	In	Sb	La	Ce	Ho	Hf	W	Tl	Ac		
0.0033	0.0175	0.0150	0.0048	0.0197	0.0386	0.0032	0.0147	0.0039	0.0122		
He	Al	**Sc**	Cu	Ge	Sm	Er	Ir	Bi	Bk	Fm	Rf
0.0493	0.0322	0.6667	0.0920	0.0160	0.0033	0.0541	0.0426	0.0091	0.0025	>0	0.0043
Bh	Ds	Mc	Ts								
0.0252	0.0009	0.0014	0.0004								
0	Na	Mg	Si	**Ti**	Cr	Mn	Rb	Ru	Rh	Cs	Pm
0.0416	0.0361	0.0064	0.0621	0.6667	0.0098	0.0032	0.0148	0.0438	0.0603	0.0038	0.0002
Dy	Yb	Re	U	Sg	Hs						
0.0019	0.0097	0.0074	0.0283	0.0027	0.0013						
0	Sc	**V**	Mn	Cu	Ge	Kr	Mo	Te	Tb	Er	W
0.0368	0.0065	0.6667	0.0239	0.0064	0.0051	0.0417	0.0088	0.0721	0.0068	0.0028	0.0095
Ir	Au	Bi	Pu	Am	Bk	Es	No	Rf	Bh	Ds	Rg
0.0054	0.0092	0.0074	0.0031	0.0130	0.0038	0.0040	0.0313	0.0046	0.0223	0.0016	0.0003
Fl	Mc	Og									
0.0050	0.0016	0.0004									
0	**Cr**	Mn	Kr	W	Au	Pb	Am	No	Lr	Hs	Fl
0.0865	0.6667	0.0845	0.0491	0.0035	0.0012	0.0118	0.0073	0.0804	0.0008	0.0017	0.0045
Og	119										
0.0017	0.0003										
Mn	No										
0.6667	0.3333										
Si	**Fe**	U									
0.0359	0.6667	0.2974									
He	**Co**	Ge	Bh	Mt	Lv						
0.0870	0.6667	0.1822	0.0432	0.0183	0.0028						
Be	Ca	Mn	**Ni**	Zn	Kr	Nb	Rh	Sb	Cs	Ho	W
0.1499	0.0084	0.0216	0.6667	0.0166	0.0179	0.0005	0.0129	0.0007	0.0204	0.0586	0.0021
Au	At	Am	Es	No	Mt	Rg	Nh	Fl	Lv	Og	
0.0201	0.0001	0.0005	0.0006	0.0017	0.0003	>0	>0	0.0002	0.0002	>0	
Cu	Er	Bi	Rf	Ds	Mc						
0.6667	0.1064	0.1810	0.0106	0.0303	0.0051						
Zn	No	Rf	Db	Mc	119						
0.6667	0.2974	0.0050	0.0031	0.0265	0.0013						
He	Na	Al	Si	Sc	**Ga**	Ge	Mo	Ru	Te	Pr	Sm
0.0207	0.0650	0.0052	0.0150	0.0440	0.6667	0.0122	0.0159	0.0811	0.0073	0.0017	0.0115

Er	Yb	Ir	U	Sg	Bh						
0.0023	0.0165	0.0090	0.0216	0.0043	>0						
He	**Ge**	Ir	Bk	Fm	Bh	Ts					
0.1518	0.7023	0.0043	0.0125	0.0004	0.1273	0.0013					
Si	**As**	U									
0.1470	0.6667	0.1863									
He	Ge	**Se**	Kr	Te	Sm	Tb	Ho	W	Au	At	Ac
0.0393	0.0299	0.6667	0.0540	0.0043	0.0545	0.0140	0.0028	0.0193	0.0043	0.0140	0.0069
Pu	Am	Bk	Es	Fm	No	Lr	Rf	Bh	Mt	Rg	Fl
0.0051	0.0061	0.0042	0.0070	0.0070	0.0072	0.0049	0.0042	0.0287	0.0035	0.0002	0.0037
Mc	Lv	Ts	Og								
0.0053	0.0003	0.0017	0.0009								
Si	Mn	**Br**									
0.2111	0.1223	0.6667									
0	C	Mg	Cr	Mn	**Kr**	Rb	Rh	In	W	Re	Au
0.0134	0.0656	0.0033	0.0233	0.0213	0.6875	0.0291	0.0163	0.0635	0.0205	0.0185	0.0029
Pb	Ra	Am	No	Lr	Hs	Fl	Lv	119			
0.0046	0.0027	0.0026	0.0196	0.0005	0.0032	0.0012	0.0004	>0			
Rb	No	Fl									
0.6667	0.2941	0.0393									
Sr	Sb										
0.6667	0.3333										
Y	Bh	Mt	Lv								
0.6667	0.3025	0.0220	0.0088								
Si	Zr	**Mo**	Bi	Ds							
0.1832	0.6667	0.0623	0.0717	0.0163							
Nb	Ho	Mt	Lv								
0.6667	0.3328	0.0005	0.0001								
Ge	**Mo**	Er	Ir	Bi	Bk	Rf	Bh	Ds	Mc		
0.1034	0.6667	0.0317	0.0659	0.0443	0.0059	0.0114	0.0413	0.0187	0.0108		
Tc	Rf	Db	Fl	Mc	Ts						
0.6667	0.0388	0.0172	0.2422	0.0173	0.0180						
Ru	U										
0.6667	0.3333										
Mg	Cr	Mn	Kr	**Rh**	Po	No	Db				
0.0398	0.0220	0.0211	0.1320	0.6944	0.0030	0.0871	0.0007				
Na	Ge	Y	Ru	**Pd**	Ag	In	La	Ce	Yb	Tl	Pb
0.1008	0.0083	0.0064	0.1190	0.6667	0.0057	0.0026	0.0071	0.0009	0.0271	0.0075	0.0003
U	Sg	Hs									
0.0432	0.0043	>0									
Ag	In	Ir	Rf	Bh	Hs	Mt	Ds	Mc	Lv	Ts	
0.6667	0.0266	0.1638	0.0153	0.0935	0.0041	0.0028	0.0122	0.0055	0.0070	0.0023	
Si	**Cd**	U	Am	Fl							
0.1624	0.6667	0.1468	0.0158	0.0083							
Kr	**In**	W	Au	Am	Es	No	Lr	Rg	Nh	Fl	Og
0.1225	0.6667	0.0191	0.0190	0.0363	0.0456	0.0395	0.0015	0.0028	0.0054	0.0353	0.0064
Si	**Sn**	U	Bk								
0.0928	0.6667	0.2341	0.0065								
Sb	Mt	Lv									
0.6667	0.2568	0.0766									
Ge	**Te**	Bk	Fm	Bh	Ts						

0.1770	0.6667	0.0136	0.0024	0.1385	0.0018						
I	Pm										
0.6667	0.3333										
C	Mg	Sc	Cr	Mn	Cu	Ge	Kr	Rb	Mo	Rh	In
0.0132	0.0250	0.0005	0.0114	0.0034	0.0020	0.0015	0.0578	0.0777	0.0116	0.0004	0.0092
Te	**Xe**	Pr	Er	W	Re	Ir	Au	Pb	Bi	Ra	Pu
0.0029	0.6667	0.0071	0.0099	0.0127	0.0471	0.0039	0.0023	0.0065	0.0010	0.0034	0.0011
Es	Lr	Rf	Bh	Hs	Ds	Fl	Mc	Ts			
0.0027	0.0020	0.0013	0.0078	0.0049	0.0015	0.0003	0.0014	0.0003			
Kr	**Cs**	Am	No	Fl	Og	119					
0.0930	0.6667	0.0040	0.2122	0.0220	0.0017	0.0005					
Ba	U										
0.6667	0.3333										
La	Fm	Bh	Mt	Lv	Ts						
0.6667	0.0115	0.3029	0.0109	0.0048	0.0032						
Cr	Kr	In	Sb	**Ce**	At	Mt	Nh	Lv	Og		
0.0185	0.0668	0.0811	0.0709	0.6667	0.0308	0.0420	0.0065	0.0083	0.0085		
Pr	Mc										
0.6667	0.3333										
Nd	Db										
0.6667	0.3333										
Pm	119										
0.6667	0.3333										
He	Ge	Mo	**Sm**	Ir	Bh	Ts					
0.0294	0.1643	0.0983	0.6667	0.0305	0.0104	0.0004					
Eu	Au	U	Sg								
0.6667	0.1060	0.1902	0.0371								
Cr	Kr	Mo	In	**Gd**	W	Pu	Am	Bk	Es	Hs	Ds
0.0193	0.0322	0.0613	0.0435	0.6667	0.0660	0.0060	0.0148	0.0040	0.0238	0.0102	0.0331
Fl	Mc	Og									
0.0077	0.0076	0.0042									
Mn	Sb	**Tb**	Pb	No	Lr	Hs	Fl				
0.1929	0.0918	0.6667	0.0173	0.0058	0.0018	0.0014	0.0223				
Dy	No										
0.6667	0.3333										
Ni	**Ho**	Fl	Lv	Og							
0.3233	0.6667	0.0045	0.0047	0.0008							
Cu	Mo	**Er**	Bi	Rf	Ds	Ts					
0.1070	0.0673	0.6667	0.1351	0.0080	0.0069	0.0091					
Tm	No	Rf	Db	Mc	119						
0.6667	0.1960	0.0207	0.0143	0.1018	0.0006						
Lu	U										
0.6667	0.3333										
Ge	Mo	In	**Hf**	At	Ac	Bh	Mt	Ts	Og		
0.1398	0.0707	0.0595	0.6667	0.0285	0.0240	0.0065	0.0036	0.0003	0.0005		
Cr	Kr	Hf	**W**	Tl	Ac	Am	No	Lr	Hs	Rg	Nh
0.0483	0.0345	0.0162	0.7034	0.0611	0.0587	0.0131	0.0149	0.0003	0.0447	0.0011	0.0021
Fl	Og										
0.0011	0.0005										
Cu	Mo	Te	Sm	Er	**Ir**	Bk	Rf	Bh	Mc		

0.0256	0.0254	0.0290	0.1336	0.0483	0.6932	0.0130	0.0047	0.0260	0.0013	
Au	No	119								
0.6667	0.3303	0.0030								
Sm	**Tl**	Bh	Mt	Lv						
0.1362	0.6667	0.1735	0.0159	0.0078						
Pb	Fl	Og								
0.6667	0.1918	0.1416								
Kr	Mo	Ir	**Fr**	Lr	Rf	Bh	Hs	Ds	Mc	Ts
0.0263	0.0199	0.1176	0.6667	0.0108	0.0160	0.1051	0.0058	0.0230	0.0063	0.0026
Ra	No	Fl	Og							
0.6667	0.2809	0.0494	0.0030							
Ac	Mt	Lv								
0.6667	0.2837	0.0497								
Np	Bh									
0.6667	0.3333									
Cf	Mc									
0.6667	0.3333									
Es	Lv									
0.6667	0.3333									

Note. "H-H", "He-He", ..., "Es-Es" sorts of frequencies are given to determine the nuclear affinity of an element for itself and should not be considered as isotope state. Value “>0” means a range of “>0<0.0001”

Based on the given frequencies it is possible to calculate relative frequencies of isotope states as the nuclear affinity values. If the nuclear affinity of a chemical element for itself exceeds 0.6667, it indicates that there is possibly a general nuclear cubic structure, which in all three mutually perpendicular faces of a large cube, gives projections of integers characterizing only this element.

Some chemical elements can present no isotope states at all; the number of isotopes can exceed the number of isotope states and vice versa. Besides the spatial association of chemical elements and the phenomenon of nugget formation, we are interested in the research of all isotope states associated with radioactive elements, which do not occur in nature. These states can probably lead to the uncertainty of spatial arrangement of atoms, and they also can influence the progress of chemical reactions and the processes of dissemination and concentration. This property is proposed to be named as the uncertainty of nuclear affinity, which is assumed to be associated with certain kinds of chemical elements properties, for example their toxicity.

All radioactive chemical elements including americium have no isotope states except for technetium, promethium, francium, actinium and radium. There are 10 highly toxic chemical elements out of 29 ones having no more than three isotope states. Such toxic elements as beryllium, barium, and promethium have one isotope state; arsenic, antimony, lead and actinium have two isotope states; radium isotope is characterized by the three ones. Vanadium and thallium can be mentioned as an exception, with their 26 and 4 isotope states respectively.

The link of isotope states of chemical elements with their toxicity can be also seen by comparing iron and more toxic manganese: the chemical elements are different as manganese is characterized by the nuclear affinity for transuranic nobelium while iron reveals the affinity for silicon and uranium.

The uncertainty of the nuclear affinity of chemical elements based on their isotope states is proposed to be calculated as the one being increased by 1/3 difference between the amount of nuclear affinity for chemical elements with atomic numbers 96 to 119 and the sum of the nuclear affinity of a chemical element for the first 95 elements of the periodic table found in nature, including conditional Zero chemical element. According to the available data the uncertainty of iron U_{Fe} can be estimated as U_{Fe} = 0-3569/12000-431/12000 +1/3 = 0. The calculations of U_{Mn} for manganese are equal to 4000/12000-0 +1/3 = 2/3.

Table 2. The uncertainty of nuclear affinity values of chemical elements

Number	**Element**	**Uncertainty**	**Number**	**Element**	**Uncertainty**	**Number**	**Element**	**Uncertainty**
1	H	0.1025	28	Ni	0.00617	55	Cs	0.47267
2	He	0.21492	29	Cu	0.09183	56	Ba	0
3	Li	0.08225	30	Zn	0.66533	57	La	0.66667
4	Be	0.20617	31	Ga	0.00874	58	Ce	0.1305
5	B	0.10025	32	Ge	0.31867	59	Pr	0.66667
6	C	0.40683	33	As	0	60	Nd	0.66667
7	N	0.00128	34	Se	0.15747	61	Pm	0.66667
8	O	0.00483	35	Br	0	62	Sm	0.02167
9	F	0.00081	36	Kr	0.15827	63	Eu	0.07427
10	Ne	0.13406	37	Rb	0.66667	64	Gd	0.18083
11	Na	0	38	Sr	0	65	Tb	0.06267
12	Mg	0.22617	39	Y	0.66667	66	Dy	0.66667
13	Al	0.154	40	Zr	0.0325	67	Ho	0.02
14	Si	0.02767	41	Nb	0.00115	68	Er	0.048
15	P	0.00133	42	Mo	0.17617	69	Tm	0.66667
16	S	0.01549	43	Tc	0.66667	72	Hf	0.02183
17	Cl	0.00517	44	Ru	0	74	W	0.16622
18	Ar	0.08833	45	Rh	0.20325	77	Ir	0.11633
19	K	0.00383	46	Pd	0.00872	79	Au	0.66667
20	Ca	0	47	Ag	0.28575	81	Tl	0.39433
21	Sc	0.06944	48	Cd	0.00825	82	Pb	0.66667
22	Ti	0.00798	49	In	0.273	87	Fr	0.339
23	V	0.18638	50	Sn	0.013	88	Ra	0.66667
24	Cr	0.17883	51	Sb	0.66667	89	Ac	0.66667
25	Mn	0.66667	52	Te	0.31267	93	Np	0.66667
26	Fe	0	53	I	0	98	Cf	0.66667
27	Co	0.12833	54	Xe	0.04421	99	Es	0.66667

The maximum value of nuclear affinity uncertainty is equal to 2/3 and characterizes such toxic chemical elements as technetium, antimony, promethium, radium and lead. The calculations given make it possible to distinguish calcium - scandium, iron - manganese, copper - zinc and tin - antimony correctly basing on their toxicity. Zero value of nuclear affinity characterizes relatively non-toxic chemical elements. What about such toxic elements as arsenic and barium? Subsequently the uncertainty of nuclear affinity needs to be specified for radioactive chemical elements and chemical elements having nuclear affinity only for radioactive chemical elements (barium, gold) as well as for chemical elements with high values of nuclear affinity to chemical elements with smaller atomic weights (arsenic).

The first practical experience of applying the hypothetical general cubic structure of atom nuclei helped determine further direction in chemical elements toxicity study.

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