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The empirical law of the periodicity of elements

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Abstract

This work is devoted to the problem of periodicity of elements. The basis for these studies is the theory of the electronic structure of many-electron atoms. Within the framework of this theory, the relationship between the electronic structure of atoms and the sequence number of the element in the periodic table is revealed. It is shown that the mechanism of atom formation consists in the phenomenon of electron capture by a core-cation with an increase in the charge of the atomic nucleus per unit elementary charge. The evolution of atoms is reduced to the successive addition of electrons to the core-cation of the preceding atom. An atom is a system of nested shells. It is shown that the generally accepted 18-and 32-electron shells (and the corresponding periods of the Table) are composite shells of 10 and 14 electron shells. The shell structure of atoms predetermines the structure of the periodic system of elements. Based on the dipole-shell model of the atom and on the electronic structure of atoms in the form of highly symmetric configurations, a modified short-period periodic table of the elements was proposed. It differs from Mendeleyev's table in that in its structure three blocks of elements are distinguished according to the periodicity of 8, 10, and 14 electron atoms. The description of the electronic structure of atoms is realized within the framework of the planetary model of the hydrogen atom of Rutherford-Bohr, which on the basis of the dipole-shell model is extended to many-electron atoms. The immanent relationship between the parameters of the atom and its sequence number is shown in the Table. An empirical law of the periodicity of elements is proposed, which is a reflection of the binding energy condition as the fundamental parameter of the atom from the nuclear charge (to which the element number corresponds), screening constants, eccentricity of the elliptical orbit and effective radius.

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