The New Model of Atom

Jelenka Savkovic-Stevanovic

University of Belgrade, Faculty of Technology and Metallurgy 11000 Belgrade, Karnegijeva 4, Serbia.

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ABSTRACT

In this paper the new mathematical model of atom was derived. This model contributes quantum theory of atom. The nonstationay model and stationary model were defined. The derived model contributes atom's stability. The comparison of all models of atoms was discussed and underline. Early atomic models and latest atomic models were analyzed. Phylosopy and theory of atom were disscused. Kinetic theory of nobles gases and periodicity of properties of the elements were considered.

Keywords: Atom, theory, models, mathematical model, property, structure.

INTRODUCTION

Atoms are the basic particles of the chemical elements. An atom consists of a nucleus of protons and generally neutrons, surrounded by an electromagnetically bound swarm of electrons [1],[2].

Soon after Italian scientist Galileo Galilei expressed his belief that vacuums can exist ,1638, scientists began studying the properties of air and partial vacuums to test the relative merits of Aristotelian orthodoxy and the atomic theory. The experimental evidence about air was only gradually separated from this philosophical controversy.

Anglo-Irish chemist Robert Boyle began his systematic study of air in 1658 after he learned that Otto von Guericke, a German physicist and engineer, had invented an improved air pump four years earlier. In 1662 Boyle published the first physical law expressed in the form of an equation that describes the functional dependence of two variable quantities. This formulation became known as Boyle's law. From the beginning, Boyle wanted to analyze the elasticity of air quantitatively, not just qualitatively, and to separate the particular experimental problem about air's "spring" from the surrounding philosophical issues. Pouring mercury into the open end of a closed J-shaped tube, Boyle forced the air in the short side of the tube to contract under the pressure of the mercury on top. By doubling the height of the mercury column, he roughly doubled the pressure and halved the volume of air. By tripling the pressure, he cut the volume of air to a third, and so on.

In France Boyle's law is called Mariotte's law after physicist Edme Mariotte, who discovered the empirical relationship independently in 1676. Mariotte realized that the law holds true only under constant temperatures; otherwise, the volume of gas expands when heated or contracts when cooled.

Forty years later Isaac Newton expressed a typical 18th-century view of the atom that was similar to that of Democritus, Gassendi, and Boyle. In the last query in his book *Opticks* ,1704, Newton stated.

By the end of the 18th century, chemists were just beginning to learn how chemicals combine. In 1794 Joseph-Louis Proust of France published his law of definite proportions (also known as Proust's law). He stated that the components of chemical compounds always combine in the same proportions by weight. For example, Proust found that no matter where he obtained his samples of the compound copper carbonate, they were composed by weight of five parts copper, four parts oxygen, and one part carbon.

In this paper comparison of the atomic theories and models were studied and the new model of atom was derived.

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COMPARISON OF ATOMIC MODELS

Atomic model, in physics and chemistry, is a model used to describe the structure and makeup of an atom. Atomic models have gone through many changes over time, evolving as necessary to fit experimental data.

Early atomic model

Leucippus of Miletus, 5th century before new era, is thought to have originated the atomic philosophy of the early Greeks. His famous disciple, Democritus of Abdera, named the building blocks of matter *atomos*, meaning literally "indivisible," about 430 before new era. He suggested that atoms of the four different elements (earth, air, fire, and water) are simply spheres of different sizes, thus creating one of the first atomic models. He also suggested that these atoms move around in space, and, when collisions between the spheres occur, they can rebound or stick together, causing changes to the matter of a material. His atomic model essentially consisted of solid spheres of different sizes for different types of atoms.

The Greek atomic theory is significant historically and philosophically, but it was not based on observations of nature, measurements, tests, or experiments. Instead, the Greeks used mathematics and reason almost exclusively when they wrote about physics. Because of the influence of Aristotle, who did not agree with Democritus and other proponents of atomic philosophy, this theory was basically ignored for nearly 2000 years.

Dalton's atomic model

English chemist and physicist John Dalton [1] converted the atomic philosophy of the Greeks into a scientific theory between 1803 and 1808. His book *A New System of Chemical Philosophy* (Part I, 1808; Part II, 1810) [3], [4] was the first application of atomic theory to chemistry. It provided a physical picture of how elements combine to form compounds and a phenomenological reason for believing that atoms exist. His work, together with that of Joseph-Louis Gay-Lussac of France and Amedeo Avogadro of Italy, provided the experimental foundation of atomic chemistry. Dalton used experimental results to propose a new model of the atom in which he suggested the following:

- All matter consists of extremely small particles called atoms.
- Atoms are indestructible and resist changes [5].
- Dalton stated that atoms could not be created, destroyed, divided into smaller pieces, or transformed into atoms of other elements. He used the law of conservation of mass in the late 1700s as the basis for these conclusions.
- Elements are characterized by the mass of their atoms.
- Dalton stated that all atoms of an element are identical in shape, size, and mass.
- When atoms are involved in chemical reactions, they combine in small whole-number ratios to form what are now called molecules [6].
- Dalton suggested that two types of atoms could form molecules of different whole-number ratios. This is known to be true for such molecules as carbon monoxide and carbon dioxide—both of which are composed of carbon and oxygen atoms but which have different ratios of each.

Dalton's atomic model was readily accepted. It incorporated the already known ideas of the law of conservation of mass, the law of definite proportions, and the law of multiple proportions and matched experimental observations.

The Thomson atomic model

Lord Kelvin envisioned the atom as a sphere with a uniformly distributed positive charge and embedded within it enough electrons to neutralize the positive charge. This model was further supported by J. J. Thomson's [7] subsequent discovery of the electron.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue IX September 2024

In the years after Dalton described his atomic model, multiple experiments were performed that proved that charged particles exist. In 1897 English physicist J. J. Thomson discovered a negatively charged particle, which he called the electron. The existence of the electron showed that the 2000-year-old conception of the atom as a homogeneous particle was wrong and that in fact the atom has a complex structure. Thomson noted that the Dalton model of the atom did not include the idea of charge, and he theorized that the electrons must be within the atoms of elements. He used his discovery to strongly support the so-called "plum-pudding" model of atomic structure first proposed by Lord Kelvin. The model indicated that there were pockets of negative charges within the sphere of the atom. The advantage of the Thomson atom was that it was inherently stable: if the electrons were displaced, they would attempt to return to their original positions.

The Rutherford atomic model

Physicist Ernest Rutherford envisioned the atom as a miniature solar system, with electrons orbiting around a massive nucleus, and as mostly empty space, with the nucleus occupying only a very small part of the atom. The neutron had not yet been discovered when Rutherford proposed his model, which had a nucleus consisting only of protons.

In 1911 a former student of Thomson's, New Zealand-born British physicist Ernest Rutherford, in cooperation with other scientists, performed alpha particle experiments that led to the overturning of Thomson's model. They aimed alpha particles at a thin sheet of gold foil and then recorded the location of the alpha particle with a fluorescent screen after the interaction. They found that the majority of the alpha particles passed through the gold foil as if the foil was not there. They also found that a very small number of these alpha particles deflected at angles from the initial path, with some of the alpha particles even bouncing back along the initial path.

Rutherford concluded that there must be a small, highly dense core of matter in an atom off which the alpha particles were bouncing. He theorized that this atomic nucleus was positively charged and surmised that the electrons orbited around it. Many physicists doubted the Rutherford atomic model because it was difficult to reconcile with the chemical behavior of atoms. The model suggested that the charge on the nucleus was the most important characteristic of the atom, determining its structure.

The Bohr atomic model

Bohr atomic model of a nitrogen atom supposes. The central nucleus contains the protons and neutrons, while the electrons are found outside the nucleus.

In 1913, just two years after the Rutherford atomic model had been introduced, Danish physicist Niels Bohr, a student of Rutherford's, proposed his quantized shell model of the atom to explain how electrons can have stable orbits around the nucleus. The motion of the electrons in the Rutherford model was unstable because, according to classical mechanics and electromagnetic theory, any charged particle moving on a curved path emits electromagnetic radiation; thus, the electrons would lose energy and spiral into the nucleus. To remedy the stability problem, Bohr modified the Rutherford model by requiring that the electrons move in orbits of fixed size and energy. The energy of an electron depends on the size of the orbit and is lower for smaller orbits. Radiation can occur only when the electron jumps from one orbit to another. The atom will be completely stable in the state with the smallest orbit, since there is no orbit of lower energy into which the electron can jump. Bohr's starting point was the realization that classical mechanics by itself could never explain the atom's stability.

Bohr suggested that each orbit has a different energy level associated with it, as the distance from the nucleus determines forces acting on the electrons in the various orbits, or shells. He found that energy can be absorbed by electrons to move from a lower energy orbit to a higher energy orbit and that they release energy when moving from higher to lower energy orbits. However, despite a number of modifications to the model, by the early 1920s Bohr's model seemed to be a dead end, as efforts to generalize the model to multielectron atoms had proved futile.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue IX September 2024

Quantum atomic model

Edwin Schrödinger's model of an atom, showing an electron cloud surrounding the nucleus. In 1926 Austrian physicist Erwin Schrödinger used mathematical equations to describe the probability of finding electrons in specific positions. These equations no longer state with certainty where electrons can be found but instead describe the region of space where it is highly probable that an electron could be found.

In 1932 English physicist James Chadwick discovered a neutral particle of approximately the same mass as the proton and located in the nucleus of the atom. This particle, now known as the neutron, completed the understanding of the three elementary particles of the atom.

Later atomic model

Quantum mechanics continues to drive atomic theory. In the 1960s subatomic particles called quarks were found to exist. The proton is made up of two up quarks, each of which has a positive charge 2/3 that of the electron, and one down quark, which has a negative charge 1/3 that of the electron. The neutron is made up of one up quark and two down quarks and thus has no charge. Ken Stewart, Science Physics Physicists.

Latest atomic model: The mathematical model of atom

Jelenka Savkovic Stevanovic, Serbian scientist [8], [9] stated that the mathematical model of atom in the 2020s [8].

$$\frac{\partial \psi_\rho}{\partial t} + v_x \frac{\partial \psi_\rho}{\partial x} + v_y \frac{\partial \psi_\rho}{\partial y} + v_z \frac{\partial \psi_\rho}{\partial z} - D\left(\frac{\partial^2 \psi_\rho}{\partial x^2} + \frac{\partial^2 \psi_\rho}{\partial y^2} + \frac{\partial^2 \psi_\rho}{\partial z^2}\right) + \rho_n g + \rho_p g = 0 \qquad (1)$$

Energy changes can be descried as:

$$\rho c_p\left(\frac{\partial \psi_T}{\partial t} + v_x \frac{\partial \psi_T}{\partial x} + v_y \frac{\partial \psi_T}{\partial y} + v_z \frac{\partial \psi_T}{\partial z} - \lambda\left(\frac{\partial^2 \psi_T}{\partial x^2} + \frac{\partial^2 \psi_T}{\partial y^2} + \frac{\partial^2 \psi_T}{\partial z^2}\right) + H_n + H_p + S_r = 0 \qquad (2)$$

where ψ_ρ probability density, v geometrical velocity, g - gravity, x, y, z spatial coordinates, D - diffusivity, ψ_T temperature, c_p - heat capacity, λ - conductivity, H - energy, S_r -heat generation, t - time. Indexes n and p refer to neutrons and protons, respectively.

ATOMIC WEIGHTS AND THE PERIODIC TABLES

The periodic table of the elements from Dmitri Mendeleev's *Osnovy khimii* 1869; *The Principles of Chemistry*, one of the earliest periodic tables created [11],[12]. As more and more elements were discovered during the 19th century, scientists began to wonder how the physical properties of the elements were related to their atomic weights. During the 1860s several schemes were suggested. Russian chemist Dmitry Ivanovich Mendeleyev based his system on the atomic weights of the elements as determined by Avogadro's theory of diatomic molecules. In his paper of 1869 introducing the periodic law, he credited Cannizzaro for using "unshakeable and indubitable" methods to determine atomic weights.

The elements, if arranged according to their atomic weights, show a distinct periodicity of their properties. Elements exhibiting similarities in their chemical behavior have atomic weights which are approximately equal (as in the case of Pt, Ir, Os) or they possess atomic weights which increase in a uniform manner (as in the case of K, Rb, Cs).

Skipping hydrogen because it is anomalous, Mendeleyev arranged the 63 elements known to exist at the time into six groups according to valence. Valence, which is the combining power of an element, determines the proportions of the elements in a compound. For example, H_2O combines oxygen with a valence of 2 and hydrogen with a valence of 1. Recognizing that chemical qualities change gradually as atomic weight

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increases, Mendeleyev predicted that a new element must exist wherever there was a gap in atomic weights between adjacent elements. His system was thus a research tool and not merely a system of classification. Mendeleyev's periodic table raised an important question, however, for future atomic theory to answer: Where does the pattern of atomic weights come from?

KINETICS OF GASES

Three men—Daniel Bernoulli in 1738, John Herapath in 1820, and John James Waterston in 1845—independently developed the kinetic theory of gases. The kinetic theory of gases, like the theory of diatomic molecules, was a simple physical idea that chemists ignored in favor of an elaborate explanation of the properties of gases.

As conceived by Daniel Bernoulli in *Hydrodynamica* 1738, gases consist of numerous particles in rapid random motion. He assumed that the pressure of a gas is produced by the direct impact of the particles on the walls of the container.

Bernoulli, a Swiss mathematician and scientist, worked out the first quantitative mathematical treatment of the kinetic theory in 1738 by picturing gases as consisting of an enormous number of particles in very fast, chaotic motion. He derived Boyle's law by assuming that gas pressure is caused by the direct impact of particles on the walls of their container. He understood the difference between heat and temperature, realizing that heat makes gas particles move faster and that temperature merely measures the propensity of heat to flow from one body to another. In spite of its accuracy, Bernoulli's theory remained virtually unknown during the 18th century and early 19th century for several reasons. First, chemistry was more popular than physics among scientists of the day, and Bernoulli's theory involved mathematics. Second, Newton's reputation ensured the success of his more-comprehensible theory that gas atoms repel one another. Finally, Joseph Black, another noted British scientist, developed the caloric theory of heat, which proposed that heat was an invisible substance permeating matter. At the time, the fact that heat could be transmitted by light seemed a persuasive argument that heat and motion had nothing to do with each other.

Herapath, an English amateur physicist ignored by his contemporaries, published his version of the kinetic theory in 1821. He also derived an empirical relation akin to Boyle's law but did not understand correctly the role of heat and temperature in determining the pressure of a gas.

Waterston's efforts met with a similar fate. Waterston was a Scottish civil engineer and amateur physicist who could not even get his work published by the scientific community, which had become increasingly professional throughout the 19th century. Nevertheless, Waterston made the first statement of the law of equipartition of energy, according to which all kinds of particles have equal amounts of thermal energy. He derived practically all the consequences of the fact that pressure exerted by a gas is related to the number of molecules per cubic centimeter, their mass, and their mean squared velocity. He derived the basic equation of kinetic theory, which reads $P = NMV^2$. Here P is the pressure of a volume of gas, N is the number of molecules per unit volume, M is the mass of the molecule, and V^2 is the average velocity squared of the molecules. Recognizing that the kinetic energy of a molecule is proportional to MV^2 and that the heat energy of a gas is proportional to the temperature, Waterston expressed the law as PV/T = a constant.

During the late 1850s, a decade after Waterston had formulated his law, the scientific community was finally ready to accept a kinetic theory of gases. The studies of heat undertaken by English physicist James Prescott Joule during the 1840s had shown that heat is a form of energy. This work, together with the law of the conservation of energy that he helped to establish, had persuaded scientists to discard the caloric theory by the mid-1850s. The caloric theory had required that a substance contain a definite amount of caloric (i.e., a hypothetical weightless fluid) to be turned into heat; however, experiments showed that any amount of heat can be generated in a substance by putting enough energy into it. Thus, there was no point to hypothesizing such a special fluid as caloric [10].

At first, after the collapse of the caloric theory, physicists had nothing with which to replace it. Joule, however, discovered Herapath's kinetic theory and used it in 1851 to calculate the velocity of hydrogen molecules. Then

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue IX September 2024

German physicist Rudolf Clausius developed the kinetic theory mathematically in 1857, and the scientific world took note. Clausius and two other physicists, James Clerk Maxwell and Ludwig Eduard Boltzmann, who developed the kinetic theory of gases in the 1860s, introduced sophisticated mathematics into physics for the first time since Newton. In his 1860 paper "Illustrations of the Dynamical Theory of Gases," Maxwell used probability theory to produce his famous distribution function for the velocities of gas molecules. Employing Newtonian laws of mechanics, he also provided a mathematical basis for Avogadro's theory. Maxwell, Clausius, and Boltzmann assumed that gas particles were in constant motion, that they were tiny compared with their space, and that their interactions were very brief. They then related the motion of the particles to pressure, volume, and temperature. Interestingly, none of the three committed himself on the nature of the particles.

THE NEW MATHEMATICAL MODEL OF ATOM

The constitution of the nucleus was poorly understood at the time because the only known particles were the electron and the proton. It had been established that nuclei are typically about twice as heavy as can be accounted for by protons alone. A consistent theory was impossible until English physicist James Chadwick discovered the neutron in 1932. He found that alpha particles reacted with beryllium nuclei to eject neutral particles with nearly the same mass as protons. Almost all nuclear phenomena can be understood in terms of a nucleus composed of neutrons and protons. Surprisingly, the neutrons and protons in the nucleus move to a large extent in orbitals as though their wave functions were independent of one another. Each neutron or proton orbital is described by a stationary wave pattern with peaks and nodes and angular momentum quantum numbers. The theory of the nucleus based on these orbitals is called the shell nuclear model. It was introduced independently in 1948 by Maria Goeppert Mayer of the United States and Johannes Hans Daniel Jensen of West Germany, and it developed in succeeding decades into a comprehensive theory of the nucleus.

In this paper the new mathematical model of atom was derived. The new model involves

particles: the electron, the proton, the neutron and quark. This mathematical model includes beside space velocities, and velocity of per some property. Probability distribution function of density and probability distribution function of temperature are described as:

These mathematical equation can described as:

$$\frac{\partial \psi_\rho}{\partial t} + v_x \frac{\partial \psi_\rho}{\partial x} + v_y \frac{\partial \psi_\rho}{\partial y} + v_z \frac{\partial \psi_\rho}{\partial z} + \frac{\partial (v_i \psi_\rho)}{\partial \xi} - D\left(\frac{\partial^2 \psi_\rho}{\partial x^2} + \frac{\partial^2 \psi_\rho}{\partial y^2} + \frac{\partial^2 \psi_\rho}{\partial z^2}\right) + \rho_n g + \rho_p g + \rho_\varsigma + e_m^{ep} + e_m^{np} + e_m^{p\varsigma} + R_r = 0 \quad (3)$$

Energy wave can be descried as:

$$\rho c_p \left(\frac{\partial \psi_T}{\partial t} + v_x \frac{\partial \psi_T}{\partial x} + v_y \frac{\partial \psi_T}{\partial y} + v_z \frac{\partial \psi_T}{\partial z} + \frac{\partial (v_i \psi_T)}{\partial \xi} - \lambda\left(\frac{\partial^2 \psi_T}{\partial x^2} + \frac{\partial^2 \psi_T}{\partial y^2} + \frac{\partial^2 \psi_T}{\partial z^2}\right) + H_n + H_p + H_\varsigma + H_{e_m}^{ep} + H_{e_m}^{np} + H_{e_m}^{p\varsigma} + S_r = 0 \quad (4)\right.$$

where ψ_ρ probability density, v geometrical velocity, g - gravity, x, y, z spatial coordinates, ξ - some property, D - diffusivity, e_m^{ep} - electromagnetic force attracted between electrons and proton, e_m^{np} - electromagnetic force attracted between proton and neutron, $e_m^{p\varsigma}$ - electromagnetic force attracted between proton and quark, R_r - density generation, ψ_T temperature, c_p - heat capacity, λ - conductivity, H - energy, S_r -heat generation, t - time. Indexes n, p, ς refer to neutrons and protons, and quark, respectively.

For stationary state of substance the equations (3) and (4) become:

$$v_x \frac{\partial \psi_\rho}{\partial x} + v_y \frac{\partial \psi_\rho}{\partial y} + v_z \frac{\partial \psi_\rho}{\partial z} + \frac{\partial (v_i \psi_\rho)}{\partial \xi} - D\left(\frac{\partial^2 \psi_\rho}{\partial x^2} + \frac{\partial^2 \psi_\rho}{\partial y^2} + \frac{\partial^2 \psi_\rho}{\partial z^2}\right) + \rho_n g + \rho_p g + \rho_\varsigma + e_m^{ep} + e_m^{np} + e_m^{p\varsigma} + R_r = 0 \quad (5)$$

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue IX September 2024

$$\rho c_p(v_x\frac{\partial \psi_T}{\partial x}+v_y\frac{\partial \psi_T}{\partial y}+v_z\frac{\partial \psi_T}{\partial z}+\frac{\partial (v_i\psi_T)}{\partial \xi}-\lambda(\frac{\partial^2\psi_T}{\partial x^2}+\frac{\partial^2\psi_T}{\partial y^2}+\frac{\partial^2\psi_T}{\partial z^2})+H_n+H_p+H_\varsigma+H_{e_m}^{ep}+H_{e_m}^{np}+H_{e_m}^{p\varsigma}+S_r=0 \quad (6)$$

Equations (3) - (6) are appear the first time in literature, in this paper.

These equations can be solved numerical either for stationary or non stationary states for contours conditions and assumed parameters as well as substance data.

NOBLE GASES

The noble gases—helium, neon, argon, krypton, xenon, radon, and oganesson—have the striking chemical property of forming few chemical compounds. This property would depend upon their possessing especially stable electronic structures, that is, structures so firmly knit that they would not yield to accommodate ordinary chemical bonds. During the development of modern atomic physics and the theory of quantum mechanics, a precise and detailed understanding was obtained of the electronic structure of the noble gases and other atoms that explains the periodic law in a thoroughly satisfactory manner, periodic table of the elements with atomic numbers, symbols, and electron configurations.

The Pauli exclusion principle states that no more than two electrons can occupy the same orbit—or, in quantum-mechanical language, orbital—in an atom and that two electrons in the same orbital must be paired (that is, must have their spins opposed). The orbitals in an atom may be described by a principal quantum number, *n*, which may assume the values 1, 2, 3,…, and by an azimuthal quantum number, *l*, which may assume the values 0, 1, 2,…, $n - 1$. There are $2l + 1$ distinct orbitals for each set of values of *n* and *l*. The most stable orbitals, which bring the electron closest to the nucleus, are those with the smallest values of *n* and *l*. The electrons that occupy the orbital with $n = 1$ (and $l = 0$) are said to be in the *K* shell of electrons; the *L*, *M*, *N*,… shells correspond respectively to $n = 2, 3, 4,\ldots$. Each shell except the *K* shell is divided into subshells corresponding to the values 0, 1, 2, 3,… of the orbital quantum number *l*; these subshells are called the *s*, *p*, *d*, *f*,… subshells, and they can accommodate a maximum of 2, 6, 10, 14,… electrons. There is no special significance to the letter designations of the quantum numbers or of the shells and subshells.

The approximate order of stability of the successive subshells in an atom is indicated. The number of electrons in the atoms of the elements increases with increasing atomic number, and the added electrons go, of necessity, into successively less stable shells. The most stable shell, the *K* shell, is completed with helium, which has two electrons. The *L* shell is then completely filled at neon, with atomic number 10. The atoms of the heavier noble gases do not, however, have a completed outer shell but instead have *s* and *p* subshells only. The outer shell of eight electrons is called traditionally an octet. The *d* subshells and *f* subshells subsequently are also filled with electrons after the initially less stable orbitals are occupied, an inversion of stability having occurred with increasing atomic number.

The very long period of 32 elements results from the completion of the 4*f* subshell of 14 electrons, the 5*d* subshell of 10 electrons, and the 6*s*, 6*p* octet. The filling of the 4*f* orbitals corresponds to the sequence of 14 lanthanoids and that of the 5*d* orbitals to the 10 platinum-group transition metals.

The next period involves the 5*f* subshell of 14 electrons, the 6*d* subshell of 10 electrons, and the 7*s*, 7*p* octet. The filling of the 5*f* orbitals corresponds to the actinoids, the elements beginning with thorium, atomic number 90.

PERIODICITY OF PROPERTIES OF THE ELEMENTS

The periodicity of properties of the elements is caused by the periodicity in electronic structure [11]-[13]. The noble gases are chemically unreactive, or nearly so, because their electronic structures are stable-their atoms hold their quota of electrons strongly, have no affinity for more electrons, and have little tendency to share electrons with other atoms. An element close to a noble gas in the periodic system, on the other hand, is reactive chemically because of the possibility of assuming the stable electronic configuration of the noble gas,

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by losing one or more electrons to another atom, by gaining one or more electrons from another atom, or by sharing electrons. The alkali metals, in Group 1 (Ia), can assume the noble-gas configuration by losing one electron, which is loosely held in the outermost (valence) shell, to another element with greater electron affinity, thus producing the stable singly charged positive ions. Similarly the alkaline-earth metals can form doubly charged positive ions with the noble-gas electronic configuration by losing the two loosely held electrons of the valence shell; the positive ionic valences of the elements of the first groups are hence equal to the group numbers. The elements just preceding the noble gases can form negative ions with the noble-gas configuration by gaining electrons; the negative ionic valences of these elements are equal to the difference between eight and their group numbers. The covalence (or number of shared electron pairs) of an atom is determined by its electron number and the stable orbitals available to it. An atom such as fluorine, with seven electrons in its outer shell, can combine with a similar atom by sharing a pair of electrons with it; each atom thus achieves the noble-gas configuration by having three unshared pairs and one shared electron pair in its valence shell.

The properties of elements in the same group of the periodic system are, although similar, not identical. The trend in properties from the lighter to the heavier elements may be attributed to changes in the strength of binding of the outer electrons and especially to the increasing size of the atoms.

DISSCUSION

Various kind of models of atom in the history were developed. This paper has discussed earlier to later atomic models and latest mathematical models. The new mathematical model

derived in this paper is different from the previous mathematical model for extension in the some property dimension, density generation and electromagnetic force.

Periodic tables of element were analyzed. The properties of elements in the same group of the periodic system are, although similar, not identical. The trend in properties from the lighter to the heavier elements may be attributed to changes in the strength of binding of the outer electrons and especially to the increasing size of the atoms.

Whereas Avogadro's theory of diatomic molecules was ignored for 50 years, the kinetic theory of gases was rejected for more than a century. The kinetic theory relates the independent motion of molecules to the mechanical and thermal properties of gases—namely, their pressure, volume, temperature, viscosity, and heat conductivity was considered in this paper.

CONCLUSION

In this paper atomic theory and structures of atom were studied. History of atomic models have shown. The new mathematical model of atom was derived including extension, in refer to previous mathematical model, with 3+n dimension, mass generation and electromagnetic force. This mathematical model contributes atomic quantum theory and stability of the atom.

The kinetics of gases history and Maxwell probability distribution function of gases motion were studied in this paper.

With the development of modern atomic physics and the theory of quantum mechanics, a precise and detailed understanding were obtained of the electronic structure of the noble gases and other atoms that explains the periodic law, periodic table of the elements with atomic numbers, symbols, and electron configurations.

How the physical properties of the elements are related to their atomic weights were considered and should be focused in the future work.

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