Global Journals LaTeX JournalKaleidoscope™
Artificial Intelligence formulated this projection for compatibility purposes from the original article published at Global Journals. However, this technology is currently in beta. *Therefore, kindly ignore odd layouts, missed formulae, text, tables, or figures.*

The Liquid-Drop Model of Electron and Atom

A. S. Dubrovin

Received: 15 December 2015 Accepted: 4 January 2016 Published: 15 January 2016

Abstract

The liquid-dropmodel of nuclear proposed byBohr and Weizsacker, it was a great success and allowed to explain a number of its properties. This modelis useduntil now.The paper attempts to build a model of the electron dropping admitting finding it, both in liquidandin the condensed state. Using this modelit possible to construct liquid hydrogen atom modeland explain the phenomenon of superconductivity.

Index terms— atom, electron, liquid-dropmodel of nuclear, liquid-drop model of electron, coefficient of surface tension, superconductivity

The Liquid-Drop Model of Electron and Atom F. F. Mende ? & A. S. Dubrovin ? I. Introduction henomenon of the electrization of dielectrics known long ago. With the friction the dielectrics acquire booster charge, in this case the electrons pass from the dielectrics with the smaller dielectric constant to the dielectric, whose dielectric constant is more. Millikan established that with the dispersion in air of oil of his drop the discrete charges acquire. This made it possible to make the conclusion that the charges can have only discrete variable and the measured discrete magnitude of the charge of drops was defined as electron charge. Experience does not give the possibility to establish, from where drops obtained discrete charges. These charges could be obtained with the transformation of oil into the drops in the process of its dispersion.

The discrete charge of drop they could obtain also with interaction with the nozzle of atomized-spray injector, or in the process of interaction with atmospheric air. In air be contained to always vapors of water, and since the dielectric constant of water is great, i.e. molecules could take away charges in the drops of oil. As a result these experiments electron began to consider ball-shaped formation with the specific sizes and the discrete charge. Since was established that the electron has discrete charge and has ball-shaped form, became a question about the special features of its presence in the constitution of atom. The idea of the Bohr orbits of electron in the atom thus was born. This idea assumes that the electrons revolve around the positively charged nucleus, being found in specific orbits. Passage from one orbit to another is accompanied by the emission of the quanta of the electromagnetic radiation, when each quantum bears the specific bundle of energy. These assumptions became the basis of quantum mechanics. But in this Author ? : mende_fedor@mail.ru model there exist the contradictions, which are not removed to the these rapids. With its electron motion must continuously emit electromagnetic waves, but, moving in the constitution of atom, it does not emit. In addition to this the simplest atom of hydrogen, which consists of the proton and the electron revolving around it, must have magnetic moment, but hydrogen atom of this moment does not have. We must conclude for this reason that the physically substantiated model of the simplest atom, which is hydrogen atom, until there exists.

But problems are located not only with electron and atom of hydrogen. Is not clear nature of structure and proton, or complex nuclei, in which act nuclear forces. It proposed the liquid-drop model of nuclear structure in 1936. Boron in order to explain the long times of life of the excited nuclei of the heavy elements, the generatrix during capture of the slow neutrons [1]. It developed Weizsacker, considering nucleus as the spherical drop of incompressible charged nuclear fluid [2]. The proposed model had large haste, and with its aid it was possible to explain many properties of nuclei and to, in the first place, obtain semi-empirical formula for the nuclear binding energy.

1 II. The Liquid-Drop Model of Electron and Atom

In the article is examined the liquid-drop model of electron and atom, which assumes existence of electron both in the form the ball-shaped formation and in the form liquid [3,4]. This model is built on the same principles, on which was built the liquid-drop model of nucleus, proposed by Bohr and Weizsacker.

1 II. THE LIQUID-DROP MODEL OF ELECTRON AND ATOM

The electron can be found in the bound state in the constitution of atom, and also in the free state in the form of electron beams or near the incandescent cathode in the electronic devices. In the free state electron to be found also in the conductors, when it can freely be moved into the tele-conductor. But if we consider electron the ball-shaped formation of the specific sizes, then problems here appear. In the superconductive state the depth of penetration of magnetic fields on and currents composes values the strand of several hundred angstroms, while the value of the surface roughness it is measured by microns. The electron velocity in superconductive niobium with the critical magnetic field is about 300 m/s. If electron was ball, then moving along so twisting a trajectory, it due to the inertial forces would destroy surface, but this it does not occur. Therefore possible being to assume that located in the composition of conductors, electrons present liquid, and they move according to its laws. When conductor they warm to the high temperature, this liquid similar to water vapor evaporates from the surface of conductor. After exceeding the limits of conductor, vapors of this liquid are condensed into the drops, forming electrons.

Liquid has the surface tension, because of which the drop of liquid acquires ball-shaped form. In this case internally the pressure in the drop is created by the forces of surface tension, which act on the surface. The pressure, created by the surface of drop is determined by the relationship2 p r ? ? = (2.1)

where? -coefficient of surface tension, rradius of drop. The electron is had the external electric field, which attempts to tear electron, these force fields on in the direction they are reverse to the forces of surface tension. Their pressure on the surface of electron is determined by the relationship.2 0 1 2 E s p E ? = (2.2)

where s E -tension of electrical fields on the surface of electron. The tension of electrical fields on on the surface of electron it is determined by the relationship where e -electron charge, 0 ? -the dielectric constant of vacuum, e r -a radius of electron.

Equalizing relationships (2.1) and (2.2) and taking into account relationship (2.3) we obtain the coefficient of surface tension for the electronic liquid For the comparison let us point out that for the water the value of surface tension is 73 J/m 2 , and for mercury it is equal to 487 J/m 2 .

A classical radius of electron composes 2.8x10 -15 m. Experiments on the measurement of a radius of proton showed that its diameter was equal 9x10 -16 m.

If we attempt ourselves to place proton inside the electron, then the fields of proton neutralize the charge of electronic liquid, after converting it into the usual badly compressible liquid. Volumetric drop will begin to be enlarged, being converted into the shell (Fig. 1). This shell will be extended until sets in the equilibrium between the electric forces, which attempt to press sphere and to the elastic forces of the electronic liquid, which prevent this compression. This process will determine the radius of the atom of hydrogen, which is equal 5.3x10 -11 m. Since the charge of electronic liquid is equal to the charge of proton, electric fields outside the atom will be absent. Electrons in the metal are considered as electron gas, to which it is possible to apply kinetic theory of gases. It is considered that the electrons, as the atoms of gas in the kinetic theory, are the identical solid spheres, which move along the straight lines until they encounter with each other. It is assumed that the duration of separate collision is negligible, and that between the atoms it acts no other forces, except the forces, which appear at the moment of collision. Since electron is negatively charged particle, then for observing the condition of electroneutrality in the solid tele-also must be the particles of another type, i.e., the positively charged ions. Drude assumed that the compensating positive charge belongs to the ions, which it considered fixed.

Despite the fact that gas density of conduction electrons is approximately 1000 times more than the density of classical gas at normal to temperature and pressure, in the Drude model the methods of the kinetic theory of the inert rarefied gases adapt. The basic assumptions of the theory of the Drude consist of the following:

In the interval between the collisions is not considered interaction of electron other electrons and ions even it is considered that each electron moves with the constant velocity along the straight line. Further, it is considered that in the presence of external fields on electron it moves in accordance with Newton's law. In the Drude model, as in the kinetic theory, collisions are the instantaneous events, which suddenly change the electron velocity, and time between two sequential collisions of is called relaxation time. This time enters into the relationship, which determines the conductivity of the metal2 ne m ? ? = .

In this case the connection between the current density in the metal and the tension of electric field takes the form:? = j E.

It is assumed that the electrons come into the state of thermal equilibrium with the lattice exclusively because of the collisions.

The theory of the Drude satisfactorily describes the phenomenon of the conductivity of metals and up to now successfully it is used in the electrodynamics.

The drop theory, when electronic component in the metal is considered as electronic liquid, changes approach to the determination of the conductivity of metal. Task is converted into the hydrodynamic task along the flow around obstacles of the moving liquid. With the flow of the liquid about the fixed obstacles are two regimes: laminar and turbulent. For each form of flow there is critical Reynolds number, which determines passage from the laminar flow to the turbulent. With the fulfillment of conditions Re Re cr ? occurs laminar flow, with Re Re cr ? in the liquid appear turbulences. With the laminar flow of liquid energy losses be absent, and, therefore, is absent resistance. In the turbulent regime, with the diffraction of obstacles in the liquid appear turbulences, which lead to the energy losses. Specifically, by this it is possible to explain the fact that even at temperatures, which are approached absolute zero, the end resistance is observed in metals. But if the obstacles streamlined

with liquid accomplish oscillatory or other motions, then this leads to additional turbulences, and, therefore, also to an increase in the resistance. And the greater the amplitude of the fluctuations of the streamlined obstacles, the greater the resistance. This circumstance leads to the dependence of the resistance of metals on the temperature, since. with an increase in the temperature the amplitude of the oscillations of lattice ions increases.

The approach examined can be used for explaining this phenomenon as the superconductivity, which can be the consequence of the passage of the flow of electronic liquid from the turbulent to the laminar.

Superconductors have the critical temperature, lower than which they convert to the superconductive state. This means that with the amplitudes of the oscillations of lattice ions of superconductor the laminar possible flow of electronic liquid is lower than the certain critical value. In the superconductors of the second kind there is a phase of the mixed state, when vortex formations can be created with the way of the imposition of external magnetic field. In this case Abrikosov vortices are formed. With the flow of electronic liquid these vortices begin to move, which leads to the appearance of resistance. The case, when in connection with the presence of the defects of crystal lattice, vortices are attached on such defects, is exponential, in this case the vortices cannot move, and resistance is absent. In the usual hydrodynamics this situation is realized be it cannot.

The liquid-drop model of atom examined transfers a question about the presence of resonances in the atom into the mechanical task. If there is an elastic shell, then it has the infinite number of mechanical resonances. These resonances can be to bear the axial nature, when standing wave has axial symmetry. Are possible also the resonances, when the integer of halfwaves is plotted along the equator of sphere. But this system will possess still one type of the fluctuations, which generate the circularly polarized electromagnetic radiation. During the collision with other it will pass the displacement of electron shell on the relation to the nucleus as atoms. As a result this is formed the being varied and simultaneously revolving electric dipole. The emission of this dipole will be received by receiver as the emission of the specific frequency, modulated in the amplitude, and which, therefore, contains the carrier frequency and side frequencies. The totality of such frequencies will compose the radiation spectrum of atom.

The proposed liquid-drop model of electron and atom this thus far only hypothesis, but it has right to existence as the liquid-drop model of nucleus. We attempted to describe only very idea of drop approach to the circumscription of electron, further development of these ideas in addition to of the liquid-drop model of Year 2016 J

2 III. Conclusion

The liquid-dropmodel of nuclear proposed byBohr andWeizsacker, it was a great successand allowedto explain a numberof its properties. This modelis useduntil now.The paper attempts tobuild amodel of the electrondropingadmittingfindingit,both in liquidandin the condensed state. Usingthis modelit possible to constructliquidhydrogen atom modeland explainthe phenomenon of superconductivity.The proposed liquid-drop model of electron and atom this thus far only hypothesis, but it has right to existence as the liquid-drop model of nucleus. We attempted to describe only very idea of drop approach to the circumscription of electron, further development of these ideas in addition to of the liquid-drop model of nucleus can lead to the creation of the generalized liquid-drop model of atom. [1]

[1]© 2016 Global Journals Inc. (US)

1 

Figure 1: Fig. 1 :

.1 Global Journals Inc. (US) Guidelines Handbook 2016

www.GlobalJournals.org

[Bohr ()] , H Bohr . *Neutron captureand structure ofthe nucleus.Phys* 1936. 4 p. 4.

[Mukhin ()] , K M Mukhin . *Experimental Nuclear Physics.Moscow:Energoatomizdat* 1993.

[Mende (2015)] 'Liquid-Drop Model of Electron and Atom'. F F Mende . http://www.aascit.org/journal/archive2?journalId=977&paperId=1787 *Publication Date*, (Page) May 6, 2015. 1 p. .

[Mende ()] *Liquid-Drop Model of Electron and Atom, Engineering Physics*, F F Mende . http://infiz.tgizd.ru/ru/arhiv/13754 2015. 3 p. .