ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 10, Issue, 07(B), pp. 33437-33441, July, 2019

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

ELEMENTARY PARTICLES AND ELECTROMAGNETIC RADIATION

Utelbayev B.T[1]., Suleimenov E.N[1] and Utelbayeva A.B[2]

[1]Kazakhstan-British Technical University, Almaty, Kazakhstan
[2]M. Auezov South Kazakhstan State University, Shymkent, Kazakhstan

DOI: http://dx.doi.org/10.24327/ijrsr.2019.1007.3671

ARTICLE INFO

Article History:
Received 4th April, 2019
Received in revised form 25th May, 2019
Accepted 18th June, 2019
Published online 28th July, 2019

ABSTRACT

According to the classical theory of electromagnetic radiation of condensed systems the process of radiation occurs when random thermal oscillations of particles in the atomic-molecular structure occur. And the radiation power increases with decreasing wavelength. However, this is not supported by experimental data. To explain such features of the electromagnetic radiation of heated bodies, M. Planck put forward a hypothesis about the quantum nature and discontinuity of the radiation process, which allowed to solve the problem. M. Planck believed that absorption occurs continuously. A.Einstein supplemented the hypothesis by introducing the idea about discontinuous of absorption. At the same time, each link of a material object exhibits certain physicochemical and quantum mechanical properties with the quantitative ratio of the constituent elements, with the structural and energetic correspondence of the system. Consequently, microscopic phenomena are reflected in the manifestation of the macroscopic properties of substances and a separate consideration of the structural elements of this system without taking into account their interaction in many cases leads to a distortion of reality. In this article, in order to clarify the micro-macroscopic relationship electromagnetic radiation and the absorption of energy by a substance from massive formations to the atomic-molecular state are discussed, where the constituent elements exhibit corresponding spectra. The distribution of energy in the spectrum of electromagnetic radiation of heated bodies in the scientific literature is explained by the transition of electrons from the excited atomic state to their original stationary position. In this case, the process is accompanied by the release of excess energy in the form of a photon quantum representing the dual nature of the movement of microparticles with manifestations of a standing wave. The frequency of the emission of photons and its relation to the cyclic frequency characterizing the change in the amplitude of the vibrational motion in units of radianare considered in detail. Based on the structural-energetic correspondence of matter the formation of combinations of "elementary energy carriers" in the nuclear-electronic structure of substances in the form of "electromagnetic particles" with loss the characteristic of their motion in a free state is proposed. In this case, combinations of elementary particles are formed in the atomic-molecular structure of substances with a change in their free movement and, accordingly, in their energy characteristics. Depending on the process conditions these "electromagnetic particles" manifest themselves in the form of heat, light, electricity, and other forms of energy transfer. These phenomena clearly demonstrate the mechanism of energy transfer by elementary particles. That is, "energy" characterizes the movement of a material object.

INTRODUCTION

Considering the properties of substances at the macroscopic level, as a rule, there are numerous discrepancies with the interpretation of micro-macro phenomena, which is associated with a lack of understanding and the lack of specific ideas about a single integral object and the relationship of its elementary components [1, 2]. Modern scientific advances in the field of atomic-molecular structure of substances revealed the world of microphenomena with unusual properties of micro-objects [3-6]. And to obtain reliable data on the construction of substances and energy manifestations with the participation of elementary particles, their spectra from massive formations to the atomic-molecular state are studied. As you know, a spectrum is a distribution of values of a physical quantity, which is usually understood to mean the frequencies of electromagnetic radiation or absorption by a system of elementary particles of photons with energy ***hν*** [7]. In [8] it is noted that the radiation itself has a discrete structure, i.e. implemented by elementary particles - photons. The author [9]

Corresponding author:* **Utelbayev B.T
Kazakhstan-British Technical University, Almaty, Kazakhstan

asserts that "... an electromagnetic wave of a photon with its frequency is the hallmark of the atom of the molecule of the substance under study, that is, when it is intensely heated (photon irradiated), it emits photons with this frequency absorbs them". Of course, the emission spectra (absorption) of photons of a material object is an important characteristic of it, which allows you to set the composition, some characteristics of its structure and to obtain information about the energy interactions between the structural elements [10]. With their help, solid, liquid and gaseous substances can be analyzed for almost all chemical elements and spectra of various atoms and molecules differ in color, position by the number of individual luminous lines, etc. [7-10]. And all this requires taking into account the interrelation of micro-macroscopic properties of material objects and in-depth consideration of the atomic-molecular structure and the nature of the elementary particles under electromagnetic radiation. In this article, on the basis of scientific and experimental spectroscopic data, the nature and character of the movement of elementary particles in the nuclear-electronic structure of substances and their energy manifestation are discussed.

DISCUSSION

With great success the wave theory of light could not explain the observed distribution of energy in the electromagnetic radiation spectrum of condensed systems within the framework of classical laws. And in 1900, M. Planck put forward the hypothesis that the emission of electromagnetic waves by atoms and molecules of a substance does not occur continuously, but discretely, that is, occurs in individual portions - quanta. A quantum of electromagnetic radiation is realized by photons - and their energy (ε) is directly proportional to the frequency of electromagnetic radiation (ν) [11]:

$\varepsilon = h\nu$ or $\varepsilon = \hbar\omega$

where $h = 2\pi\hbar = 6.626 \cdot 10^{-34} J \cdot s$ is Planck's constant, $\hbar = h / 2\pi$ is the normalized Planck's constant, ω is the cyclic frequency of the radiation.

In his calculations Planck chose the simplest model of the radiating system (cavity walls) in the form of harmonic oscillators (electric dipoles) with various fundamental frequencies taking into account the work of Rayleigh. But Planck did not associate with the energy of the oscillator its temperature, but its entropy. It turned out that the resulting expression describes the experimental data well. Analysis of the above equations makes it easy to verify the relationship of the radiation frequency and the cyclic frequency by the formula:

$\omega = 2\pi\nu$ or $\nu = \omega / 2\pi$

At the same time, it is necessary to pay attention to the fact that the absorption and emission of energy occurs during the course of a specific process in the system, for example, when it is heated or cooled, due to thermal energy. Although in the scientific literature there are different opinions on the transfer of heat, we hypothesized in [12] that the "elementary heat carriers" are " theplotrons". When influences to the system by heat, free "theplotrons" give impetus to the structural elements of the nuclear - electronic system, translating them into an excited state. In other words, the number oftheplotrons in the system increases and changes the structural and energy state of the system to another quality level.Naturally, these particles are discrete, and therefore, with a certain amount, their transition to quality occurs abruptly, which is reflected in the manifestation of the discontinuity of the emission or absorption spectra. A good example of the transition of the quantity of elementary particles into quality is the structure of atoms consisting of integer protons, neutrons, electrons and elementary particles. Despite the fact that in the system the same constituent particles are by nature, however, certain of their numbers individualize atoms, demonstrating the transition of quantity into quality with specific physicochemical characteristics. This phenomenon indicates the role of the discreteness of each elementary particle, which are the material subject in the manifestation of the structural and energy properties of the system. Studying the thermal radiation of substances based on optical and thermodynamic properties Kirchhoff concludes: "the ratio of the emissivity and absorption capacities does not depend on the nature of the radiating bodies and is a single function for all bodies only for the emission frequency (wavelength) and body temperature" [13]. This applies to both emission spectra and absorption spectra, which are observed if the rays pass through vapors of matter. When a material object is activated by thermal energy from the outside, according to Kirchhoff's law, matter emits such spectra of particles as they absorb. i.e., during emission, if they emit photons, then it can be affirmatively assumed that they absorb the same particles — photons. As is known, to obtain spectra the substance is preliminarily excited by heat, i.e. they absorb elementary heat carriers -"theplotrons," and then emit photons upon radiation. According to Kirchhoff's law, the identity of "theplotrons" and photons can be allowed. Experimental works of H. Hertz [14] that proved the existence of "electromagnetic waves" and their identity with the basic properties of "light waves" is a powerful argument that *the elementary components of these waves have the same nature* and only *differ in the nature of their movement*.

Since energy is a conceptual expression for describing the motion of matter qualitatively and quantitatively, then depending on the nature of the motion of the same particles it manifests itself in the form of light or electricity as a form of energy transfer. M. Faraday in [15], indicated that regardless of the thermal, light, chemical, physiological, magnetic or mechanical energy source, they can all manifest as the same electricity. This conclusion of M. Faraday means the identity of the nature of elementary energy carriers, which differ only in the nature of the movement. All these data serve in favor of the conclusion that photons, "theplotrons," and other elementary energy carriers are variations of the same "elementary particles" [16]. In our opinion, the predominant use of the terms "electromagnetic wave", the wavelength during radiation is associated with the interpretation of data obtained using oscillators. For example, *the cyclic frequency values characterize the change in the amplitude of an oscillating body* or *other physical quantity* (such as current value or intensity), which give graphical dependence - a sinusoid in time, i.e. wave trajectory. And by a sine wave, the wavelength, frequency of radiation, etc. are determined. Similarly, Planck's hypothesis is based on the experimental data of atomic oscillators, which determine the cyclic frequency from which the radiation frequency is calculated. Since electromagnetic radiation is realized by the emission of photons, its discreteness determines the discontinuity of the spectra, and the nature of the movement of a free photon determines the form of energy transfer. Consequently, it is necessary to consider the nature and nature of the movement of photons in space from the standpoint of - oscillation, rotation of a photon as a particle and translational motion of an object possessing simultaneously the properties of a wave and a particle:

1. The oscillatory motion of free photons in space is absurd, since there is no driving force that guides its movement periodically up and down. Moreover, if we take into account the resistance of the environment it is very difficult to predict the nature of its movement;
2. The rotational motion of it as a particle along its own axis is characterized by a point, and it makes no sense to discuss as a wave object;
3. The most likely is the translational motion of photons.

Based on the analysis of the scientific literature, we assume that photons, "theplotrons", etc. have a dipole structure and form combinations in the atomic-molecular structure of substances, changing their motion [16,17]. Direct evidence of the formation of combinations of elementary energy carriers in the nuclear-electron system is the fact that chemical, biochemical, and electrochemical reactions occur with energy manifestations. In the activated areas of the structural elements of "chemical individuals [18] under the influence of heat, light, catalyst, etc., there is a redistribution of electrons in chemical bonds with the release (absorption) of heat, light, etc., with a constant number of electrons, which clearly indicates the combinations "elementary energy carriers" with electrons of atomic - molecular structure. *Being in the Coulomb interactions in the nuclear-electron medium, the opposite poles of the dipoles attract each other like magnets, where microelectric currents appear as a result of the movement of the charged parts of the dipole. The arising microelectric currents when the poles move, have opposite directions, which causes them to push away and do not allow the poles to come closer. As a result, alternating electrical and magnetic manifestations inside the particle itself in the medium of charged particles of the nucleus and electrons leads them to a specific movement of the poles - to pulsation, which allows them to be called pulsating "electromagnetic particles"*[16,17]. The pulsation of a particle is characterized by a frequency with a change in the amplitude of oscillation and a change in the shape of the volume of the particle, which are de-Broglie standing waves. The translational motion of a set of such objects in space gives a traveling wave. The nature of the pulsating motion of "*electromagnetic particles*" does not contradict the theories of Maxwell, Planck, etc., and corresponds to the reality. According to our hypothesis, the "*electromagnetic waves*" of G. Hertz are the same "*electromagnetic particles*", which are manifested in the form of heat, light, and other forms of energy transfer during the process in the system.

It is well known, regardless of the various forms of manifestation of energy, the generally accepted wording in the scientific literature boils down to the following: "*energy is a scalar physical quantity that is a single measure of various forms of motion and interaction of matter, a measure of the transition of matter from one form to another*" [19]. The results of the process of occurrence of absorption and emission spectra, which is an exchange of quanta of the corresponding energy, shows that the process is implemented by elementary energy carriers - movements of "electromagnetic particles". Consequently, "*energy*" is *a conceptual expressiondescribing the movement of matter qualitatively and quantitatively*, which manifests itself in the form of work, heat, light, electricity, etc. Therefore, one should not consider the concept of "energy" separately from matter. With modifications of the movement of material objects, the forms of energy transfer describing this process also change. And the recognition of the accumulation of elementary particles of energy carriers in the structure of material objects and a change in their character of movement depending on the process conditions allows one to approach in a scientifically sound way when solving the extraction and use of energy resources. In nature, this analogy of the transformations that take place in the microcosm, and which manifest themselves in a different form in macroscopic formations, is commonly known as the cycle of matter and energy.

Based on the above, under conditions of thermal radiation of substances with dynamic equilibrium with the environment, it can be concluded that the total value of the kinetic energy of "elementary particles" should be equal to the energy of radiation quanta, i.e. for the same particle, the equality is true [20]:

$\sum x_i kT = hv.$

Without violating the principles of wave optics, we will use its well-known equations and the characteristic values of the ***IR wave***, which are given in reference materials. From the equation $T = hv / \sum x_i k$for near-infrared ***IR radiation*** at temperatures of 4000K and 3620K:

$4000 = 4.7994 \cdot 10^{-11} \cdot 4 \cdot 10^{14} / \sum xi \sum x_i = 4.79$

$3620 = 4.7994 \cdot 10^{-11} \cdot 3.8 \cdot 10^{14} / \sum x_i \sum x_i = 5.03$

Similarly, for the average range at temperatures about 2070 and600K, as well as for the far range of 290 and 90K, the values of $\sum x_i$ are 5.1 and 4.7; 4.96 and 5.33 respectively. Average value for $\sum x_i$:

$\sum x_i = (4.79 + 5.03 + 5.10 + 4.79 + 4.96 + 5.33) /6=5.0.$

Hence, the total kinetic energy of the thermal motion of an elementary particle that is in thermal equilibrium with the emitted particles into the environment**:** $5\ kT = hv$. Hence, $T = hv / 5\ k = 0.959 \cdot 10^{-11} \cdot v.$

You can make a conclusion that reveals the physical meaning of temperature:

the temperature of the system is determined by the frequency of the pulsations of the "electromagnetic particles" of the heat carriers - "theplotrons".

For the maximum temperature about 3173K , when hydrogen is burning from the formula $T = 0.959 \cdot 10^{-11}\ v$ we determine the frequency of heat carrier pulsation:

$v = T / 0.959\ 10^{-11} \cdot v = 3173 / 0.959 \cdot 10^{-11} = 3.31 \cdot 10^{14}\ Hz$

Similarly, according to M. Planck's formula $\varepsilon = hv$ and the total kinetic energy of the thermal motion of an elementary particle $\varepsilon = 5kT$, we calculate the energy of an elementary particle - a carrier of heat at the temperature of 3173K and a frequency of $3.31 \cdot 10^{14}$ Hz:

$\varepsilon = h\nu = 6.6261\ 10^{-34} \cdot 3.31 \cdot 10^{14} = 2{,}189 \cdot 10^{-19}$J
$\varepsilon = 5\ kT = 5 \cdot 1.38 \cdot 10^{-23} \cdot 3173 = 2{,}189 \cdot 10^{-19}$ J

Using the coefficient of transition from mass to energy, we calculate the mass of elementary particles of heat carriers:
$m = 2{,}189\ 10^{-19} / 8{,}98755 \cdot 1016 = 2{,}435\ 10^{-36}$kg
We define the same particle mass with the equation $\varepsilon = mc^2$:
$m = \varepsilon / c^2 = 2{,}189 \cdot 10^{-19} / (3 \cdot 10^8)^2 = 2{,}432\ 10^{-36}$kg

As can be seen, the calculation of the mass of the ***"theplotrons"***by two methods gives an almost perfect match. From the above formula it follows that the temperature of the system is proportional to the frequency of the pulsations of the "electromagnetic particles":

$$T = h\nu / \sum x_i\ k = 0.959 \cdot 10^{-11}\ \nu$$

Where ν is the frequency of "pulsations" of an elementary particle per second and reveals the physical meaning of temperature as one of the state parameters characterizing the thermal equilibrium of the system. Similarly, in the theory of the heat capacity of a solid in the Debye works for the maximum atomic vibrations, the ratio $h\nu_{max} / k$ is called the characteristic temperature - the Debye temperature [21]. However, the frequency of oscillations of atoms in the Debye's formula and the frequency of pulsations proposed by us are essentially two different types of motion. And the neglect of the pulsation of "electromagnetic particles" led to the existence of two views on the propagation of sunlight (I. Newton and Hooke, Huygens) [22]. In fact, a set of pulsating photons in motion create a picture of a traveling wave. Given the intense property of temperature and pressure, independent of the number of substances, we write the Clapeyron's equation for a particle in the form:

$$pV_m = k \cdot 0.959 \cdot 10^{-11} \cdot \nu$$

whereV_m is the volume of one combined particle creating pressure p; k is the Boltzmann's constant; $0.959 \cdot 10^{-11}$- temperature coefficient; ν is the frequency of oscillation of the ***"electromagnetic particle***". Analysis of the equation allows us to determine the physical meaning of the "p" for an elementary particle, which is the "elastic force - p" necessary for the pulsation of an elementary particle in the volume V_m it occupies; T-thermodynamic temperature of the system, which is an indicator of thermal equilibria with the environment. The change in V_m and p under compression causes an opposing force according to *Newton's third law* and the manifestation of the internal pressure of the system.

CONCLUSION

The stated materials allow us to put forward *a hypothesisabout "electromagnetic particles"* and shows the complexity of the atomic-molecular structures, where these particles:

- participate in the implementation of the Coulomb's electrical interaction, prevents the annihilation of nuclei with electrons and the dipole structure under the influence of an external source voltage creates an electrical and magnetic field of the conductor. As a result of pulsations, it creates a "standing wave*"*,and thecollective translational motion of "electromagnetic particles" a traveling wave;
- are in combination with electrons and the character of their movement determine the thermal, optical, magnetic, electrical, and other properties, i.e., photons, "theplotrons", etc., are varieties of "electromagnetic particles" differing in their pulsation frequency (those, they are "electromagnetic waves");
- the frequency of pulsations of "electromagnetic particles" determines the physical meaning of the temperature and the internal pressure of the system, which are in dynamic equilibrium with the components of the environment.

References

1. Electronic resource. The relationship of the composition, structure and properties of materials. htpp: //com / 5_1677668.
2. Utelbayev B.T., Suleimenov E.N., Utelbayeva A. European Researcher, The Association between Microscopic and Microscopic Properties in Chemical Transformations.2014, Vol. (76) N6-1.pp.1038-1045.
3. Tatevsky V.M. Atoms in molecules and quantum-mechanical interpretation of the concepts of the classical theory of chemical structure.//Vest.Mosk.Universitet.ser.2. Chemistry. 1999.T.40.№2.- p.75 Russian
4. Available: http: //www.books.google.com/General Chemistry Linus Pauling Google Books
5. Sivukhin D.V. General course of physics. Thermodynamics and Molecular Physics.T.2. / DVSivukhin.-M .: Nauka, 1990. - 591 p.Russian
6. Utelbayev B.T., Suleimenov E.N., Utelbayeva A., Zhanabai.Role of Atomic-Molecular Formation in Chemistry. eBook.Theory and Applications of Chemistry.2019, Vol.1 Chapter 7.
7. Elyashevich M.A. Atomic and molecular spectroscopy. - M .: Science, 1962. - 892 p.
8. Tarasov L.V. Fundamentals of quantum mechanics: Textbook. -M .: Higher School, 1978.-287p.Russian
9. Electronic resource.Vyshinsky V. The role of photons in the formation of the properties of matter.https://www.vva.kiev.ua/content/rol-fotonov-v-formirovanii-svoystv-veshchestva.Russian
10. Measuring methods of research, Spectral..vuzlit.ru ›2077199… metody_issledovaniya Russian
11. Heat radiation. Planck's hypothesis about quanta. sites.google.com ›site / opatpofizike ... planka ... kvantah ...Russian
12. 12.BTUtelbayev, ENSuleimenov, ABUtelbayeva.The Hypothesis // PONTE.Florence, Italy, International Scientific Researches Journal .Vol.72.No.2.Feb.2016, pp.18- 25
13. Electronic resource. ru.wikipedia.org ›Kirchhoff radiation law
14. Experience G. Hertz. Electromagnetic oscillations interneturok.ru ›... belektromagnitnye ... i-volny ... gertsa ...
15. Faraday M. Experimental studies on electricity. Vol.1.- M .: Publishing House of the Academy of Sciences of the USSR, 1947. - 848 p.Russian

16. B.T. Utelbaev, E.N.Suleimenov, A.B.Utelbaeva. Energy interaction of micro-macroscopic constituents of a substance // Science and World. 2019. V1.N5. (69) c.21-25
17. 17B.T.Utelbayev, E.N.Suleimenov, A.B.Utelbayeva. Structural-energy Interaction in the System: Electron - Nucleus - "Chemical individual" - Substance // IJETR, Vol.8, Iss5.Feb. 2018.
18. Utelbayev B. Suleimenov E. Utelbayeva A. Zhanabay N. Some Concepts about Substance, Chemical compound and an Element // American Chemical Science Journal. 2014.4 (2) RR.166-73
19. https://ru.wikipedia.org/wiki/Energy.Russian
20. Utelbayev BT, Suleimenov EN, Utelbayeva AB. The Essence of “Temperature”, International Journal of Scientific Research and Science. 20177.Vol.3. Issue2, Print ISSN: 2395-6011.PP.678-684
21. Krasnov K.S. Physical Chemistry. Textbook for universities. -3rd ed., Corr. - M .: Higher. shk., 2001.-512p.Russian
22. Electronic resource. The development of ideas about the nature of light. physics.ru ›textbook1 / chapter3 / section / paragraph6 /Russian

How to cite this article:

Utelbayev B.T *et al*., Elementary Particles And Electromagnetic Radiation. *Int J Recent Sci Res.* 10(07), pp. 33437-33441. DOI: http://dx.doi.org/10.24327/ijrsr.2019.1007.3671

****