Deduction of Generalized Microdynamics Equations

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Abstract

It is proposed to consider the microworld on the basis of the thin matter concept and simulate it with the use of hydrodynamics equations. It is shown that in the case of a viscous thin matter at rest with an interaction determined by the square of velocities, from the hydrodynamics equations follows the generalized nonlinear Schrödinger equation. The microdynamics equations were generalized for a moving thin matter.

Keywords: thin matter, generalized microdynamics equations, generalized hydrodynamics

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Introduction

Long since it was the practice to investigate the structure and behaviour of the physical microworld with the use of the quantum-theory models adequate to the experiment and suitable for development of new facilities. Because of this, there is little doubt that these models are useful and pragmatic.

For description of microobjects and microeffects, in particular for the light particles, it is necessary to use new models, in which, in accordance with the practice, the classical properties of the physical world are in conformity with the quantum ones. The system of microbjects can be not a statistical ensemble. At the same time, the number of microbjectscan be fairly large. There is a need for qualitatively new physical models suitable to uniquely describe effects in the finite physical systems. These models should account for different physical factors: the nonisothermality of processes, chemical reactions, and many other phenomena.

The investigations in this direction suggest the solution some fundamental problem of physics. We have the first problem of physics: how to receive the concordance between the macroscopic (classical) and microscopic (quantum) theories. It is intrested not only for the similarity of the models describing different physical phenomena, but also for the physical constructions associated with them. It is significant to investigate the composition and properties of the structural elements of analysed constructions. This problem and some advantages in its solution are described in [1], [2].

There is also a need for solving the second fundamental problem of physics: how we can realise the concordance between the microtheory and the relativity theory. In particular, it is necessary to take into account correctly the velocities and accelerations of physical devices and the physical factors controlling them, which is not to do in the practice of the quantum theories.

The development of the theoretical microdynamics can start from the Einstein problem: is the usual quantum theory the base for the whole physics or an auxiliary element of it? This problem was formulated long ago. According to the view of Ballentine [3], Heisenberg has created a myth that Einstein did not understand the quantum mechanics. In really, Einstein considered the quantum mechanics as a satisfactory theory that, however, it can not be an principal point for the whole physics. However, neither Einstein nor other authors were able to solve the indicated problem.

It was not known for long time how one can get near this problem.The models of different parts of physics seem to be different not only formally, but also in essence. As a rule it is suggested that the physics of macroeffects, the physics of microeffects, so as physics of the attendant constructions are very different.

Let us consider the Schrödinger problem [4]: how to do the wave functions of the quantum theory and the fourpotentials of the electrodynamics agree? He believed that the atoms described "on the outside" by the Maxwell electrodynamics equations can be described "from the inside" by analogous equations. This brings up the question: how do the features and properties of physical materials used in the experiments can be taken into account ?

As a variant of development of the theory of microsystems, we will use the hydrodynamic model of the microworld. For the success of this approach it is necessary to find the place of the quantum model in the structure of the hydrodynamics equations. If this problem is solved, one can develop new micro and macromodels of the physical reality This solution clear the way for solving the Einstein problem and the Schrödinger problem of the quantum theory. A review of the methods of hydrodynamic simulation of the microworld is presented in [5]. Concrete models are described in [6]–[11].

We shall use the analogy for description of macro- and microeffects and so of macro- and microconstructions. It may be considered as the first philosophical element of the physical modelling. We receive so the model concordance of structures and activities: the objects of one matter level and the objects another one are in conformity.

We shall use additionally second philosophical element of the physical theory: different physical objects have distribution on the different matter levels.

1. Concept of a multilevel matter

We shall apply the term "physical matter" to the objects having a structure and an activity. We shall consider the physical world as a multilevel material system and shall determine a physical matter level by the system of its base material objects and their interaction. So, the physical macrobodies consist of atoms forming their own matter level. The atoms consist of electrons and nucleons, forming a new matter level.

We shall introduce a new hypothesis: the electrons and nucleons consist of new structural components (from which the light particles are composed). These components are electrically neutral particles called the elons and gravitationally neutral particles called the prolons. Let the elons and prolongs consists of positive and negative electric and gravitational precharges. Let the precharges can consist of atons: oriented one dimensional objects capable to form longitudinal and transverse connections.

We shall consider a thin matter as a physical system consisting of atoms, precharges, elons, prolons, and all the other objects formed from them as well as the objects preceding them. This matter will be called the pramatter.

Physicists have long been aware that matters of different levels can exist. They investigated different base structural elements of the matter in the physical experiments and analyze them numerically for the use in practice. The practice is based on the information about the physical components of each matter level and its properties as well as on the concordance of the levels with each other.

We shall relate each level of the physical world with "its own physical matter" in the physical and philosophical sense of the word, using the following assumptions :

- the microeffects, by analogy with the macroefects, realise on the base of properties and movements of the structural components of the own matter level and are determined by their properties, so forme constractions;
- the properties of microconstructions are determined by the properties of the interactions of their physical components;
- the indicated components as well as their movements and interactions can be calculated and determined in physical experiments;
- the approaches, notions, and conclusions obtained in the process of investigating the constructions and effects of the macroworld can be applied to the corresponding constructions and effects of the microworld.

We shall consider the theory of physical microobjects and microeffects as a link of the general theory of physical systems. We shall find unique physical models suitable for different levels of the physical world. Our analysis shall be based on the experimental and theoretical data for each level of the physical world, substantiating its material properties.

For any physical system and any practice, as the first base element of physical simulation, we shall use a system of objectively existing and coexisting physical constructions having a structure and occupying their own level in the reality . Their properties shall be determined qualitatively. As the first level of the real practice, we shall consider the theoretical and experimental representation of the totality of the characteristics and properties of microconstructions with the use of a system of quantities.

As the second base element of physical simulation, we shall use the interaction of real constructions, determining their properties and realizing through touches, relations, reactions, and mutual movements. Their properties will be determined through the system of differential and codifferential (or integral) operators. As the second level of the real practice, we shall consider a system of operators effective for the phenomena associated with these constructions and useful facilities developed on their base.

Let us take, as the third base element of physical simulation, a physical model constructed from a pair of the above indicated base elements: quantities and operators. Working models will be considered as the third element of the physical simulation.

The ideology described shall be realized in the structural simulation of atoms and molecules with the use of the pramatter concept. We shall start from the fact that the physical atoms and molecules are structural elements of macroscopic physical objects; they form their own matter level. Let us consider the special characteristics of the situation. On the one hand, atoms and molecules should be considered as bodies made from a pramatter. On the other hand, atoms and molecules are found in the pramatter.

Because of this, only a multilevel model can be considered as a complete model. The simplest of such models is a one level one. In the modern physics the majority of the models are one level models. A two level model represents a more complex variant. For example, in the description of an atom, it is necessary to represent not only the state of the system consisting of electrons and nucleons, but also the state and movement of the thin matter, in which they are found and from which they are made.

2. Hydrodynamic approach to the model of atoms and molecules

We shall determine the theoretical foundation for description of the structure and properties of atoms and molecules by the structure and behaviour of a pramatter. As the initial point of analysis, we shall use an analogy of the macroscopic model of a viscous fluid. Let us apply it, with refinements and additions to the pramatter.

It will be assumed that the density of a pramatter ρ and its kinematic viscosity η are known. Let us introduce the quantity σ characterizing the additional dynamical properties of the pramatter.

We shall write a model of behaviour of the pramatter in the form of the equations of the viscous fluid hydrodynamics:

$$\partial_i \left(N^{ij} - \frac{\eta}{\sigma} \Phi^{ij} \right) = \partial_i \Psi^{ij} \, (1) = F^j .$$

The tensor of velocities N^{ij}, the stress tensor Φ^{ij}, and the fourvector of forces F^j will be selected on the basis of additional suppositions for a concrete model. It can be changed if it will be required by the empirical data.

As a microworld model, we shall use the Schrödinger equation of the quantum theory

$$i\hbar \frac{\partial \psi}{dt} = -\frac{\hbar^2}{2m} \nabla^2 \psi + V\psi .$$

The following quantities will characterize the behaviour of the pramatter in the physical space:

$$N^{ij} = \rho v^i \otimes v^j , \ \Phi^{ij} = g^{ik} \varphi^j_k ,$$

$$N = \rho \begin{pmatrix} v^1 v^1 & v^1 v^2 & v^1 v^3 & v^1 v^0 \\ v^2 v^1 & v^2 v^2 & v^2 v^3 & v^2 v^0 \\ v^3 v^1 & v^3 v^2 & v^3 v^3 & v^3 v^0 \\ v^0 v^1 & v^0 v^2 & v^0 v^3 & v^0 v^0 \end{pmatrix} ,$$

$$\Phi = \begin{pmatrix} \partial_1 f^1 & \partial_2 f^1 & \partial_3 f^1 & \partial_0 f^1 \\ \partial_1 f^2 & \partial_2 f^2 & \partial_3 f^2 & \partial_0 f^2 \\ \partial_1 f^3 & \partial_2 f^3 & \partial_3 f^3 & \partial_0 f^3 \\ \partial_1 f^0 & \partial_2 f^0 & \partial_3 f^0 & \partial_0 f^0 \end{pmatrix} .$$

Here v^i- are the components of the pramatter fourvelocity, $\delta^j_{ik}-$ is the Kronecker tensor, $f^j = \delta^j_{ik} v^i v^k$. The fourforce acting on an element of the pramatter volume will be determined as

$$F^j = -\Phi \frac{\rho}{\sigma} f^i = -\Phi \frac{\rho}{\sigma} \delta^j_{ik} v^i v^k .$$

It will be assumed that the quantity Φ, on the one hand, characterizes the potential of the external forces and, on the other, accounts for the influence of the material constructions found in the pramatter. At this stage it cannot be determined in the general form. Real problems are concrete and should correspond to the experimental situation. Note that the microdynamics model will indirectly take into account the properties of the constructions found in the pramatter. For these purpose it is necessary to determine the form and behaviour of these constructions through the system of initial and boundary conditions. However, for the constructions themselves, additional conditions and models are required. In accordance with the formulation of the problem, the pramatter hydrodynamics can give only an indirect information on the behaviour of material constructions found in it.

We will determine the fourvelocities of the pramatter on the basis of the results obtained in the electrodynamics of moving media [12]. Let us select, in the physical space-time $T^1 \times R^3$, the coordinates

$$x^1 = x, x^2 = y, x^3 = z, x^0 = ic_g t.$$

We shall use the Minkowski tensor γ^{ij} and the Lagrange tensor θ^{ij}:

$$\gamma = diag\left(1,1,1,1\right), \ \theta = diag\left(1,1,1,\chi\right).$$

Let the scalar quantity

$$\chi = \frac{\det \theta^{ij}}{\det \gamma^{ij}}$$

belongs to the field of complex numbers. For the fourdimensional interval and the fourvelocity, we will obtain the expression

$$d\theta = \frac{ic_g dt}{\sqrt{\chi}}\left(1 - \chi\frac{u^2}{c_g^2}\right)^{1/2},$$

$$v^k = \frac{\sqrt{\chi}}{ic_g}\frac{dx^k}{dt}\left(1 - \chi\frac{u^2}{c_g^2}\right)^{-1/2}.$$

Now we have all elements for beginning of analysis.

3. Microdynamics of a pramatter at rest

Let a pramatter is at rest. Then $u^1 = u^2 = u^3 = 0$. In this case, $v^0 = \sqrt{\chi}$. For the velocity tensor $N^{ij}(0)$, the viscous-stress tensor $\Phi(0)$, and the force $F^j(0)$, we shall obtain the expressions

$$N(0) = \rho\begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & v^0v^0 \end{pmatrix},$$

$$\Phi(0) = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ \partial_1(v^0v^0) & \partial_2(v^0v^0) & \partial_3(v^0v^0) & \partial_0(v^0v^0) \end{pmatrix},$$

$$F(0) = -\frac{\rho}{\sigma}\Phi\begin{pmatrix} 0 \\ 0 \\ 0 \\ \chi \end{pmatrix}.$$

Since $v^0v^0 = \chi$. We have

$$\partial_i N^{ij} = -i\frac{\rho}{c_g}\frac{\partial\chi}{\partial t} - i\chi\frac{1}{c_g}\frac{\partial\rho}{\partial t},$$

$$\partial_i\Phi^{ij} = \frac{\eta}{\sigma}\left(\nabla^2\chi - \frac{1}{c_g^2}\frac{\partial^2\chi}{\partial t^2}\right) + \operatorname{grad}\frac{\eta}{\sigma}\cdot\operatorname{grad}\chi - \frac{1}{c_g^2}\frac{\partial}{\partial t}\left(\frac{\eta}{\sigma}\right)\cdot\frac{\partial\chi}{\partial t},$$

$$F^j = -\Phi\frac{\rho}{\sigma}\chi.$$

Let us introduce the following designations:

$$\bar{h}_1\left(l\right) = \frac{\sigma}{c_g}, \eta = 0,5\bar{h}_2^2\left(l\right).$$

In the physical approach sense, the quantities $\bar{h}_j\left(l\right), j = 1,2$ characterize the empirical properties of the l-level of the matter. They should be selected in accordance with the experiment and can obey additional dynamic equations and restrictions. The fourth component of the velocity of the pramatter at rest is determined from the equation

$$i\hbar_1\left(l\right)\frac{\partial\chi}{dt} = -\frac{\hbar_2^2\left(l\right)}{2\rho}\nabla^2\chi + \Phi\left(l\right)\chi + \Pi_1.$$

Here

$$\Pi_1 = \frac{1}{c_g^2}\frac{\eta}{\sigma}\frac{\partial^2\chi}{\partial t^2} - \frac{\sigma}{\rho}\operatorname{grad}\frac{\eta}{\sigma}\cdot\operatorname{grad}\chi + \frac{\sigma}{\rho}\frac{1}{c_g^2}\frac{\partial}{\partial t}\left(\frac{\eta}{\sigma}\right)\frac{\partial\chi}{\partial t} - i\frac{\partial\ln\rho}{\partial t}\frac{\sigma}{c_g}\chi.$$

The Schrödinger equation for a microobject with a mass m has an analogous form. For its construction, it is necessary to change

- the fourth velocity component χ for the wave function ψ,
- the quantity $\hbar_1\left(l\right)$ for the Plank constant $\hbar$,
- the variable density of the pramatter ρ for the constant particle mass m,
- the potential Φ for the potential V.

Moreover, the following conditions should be fulfilled:

- a pare of different and, in the general case, variable empirical constants should be equal to the Plank constant in the form $\hbar_1\left(l\right) = \hbar_2\left(l\right) = \hbar\left(l\right)$,

- $\Pi_1 = 0$, which restricts the range of the dynamic change in the quantities of the model.

Then a standard Schrödinger equation will be obtained.

We have found a mathematical analogy in the description of the dynamics of the pramatter, defined by the model of a fluid at rest, having internal stresses and found in the field of forces, and the dynamics of a material microobject determined by a wave function.

We may expect a physical analogy between the behavior of a pramatter fluid and the "movement" of a wave function. A material object found in a pamatter is made from the mater or the pramatter and acts on it. In the new approach, the potential of a matter atom in the Schrödinger model is determined by this algorithm. However, the model being considered does not suggest that the atom is found in the pramatter fluid. Because of this, it was impossible to describe an atom as a "living" object. Analogously, it was difficult to say something about the physical processes occurring inside the atom.

Another physical situation takes place in the case where material objects, e. g., atoms and molecules are considered as pramatter constructions on conditions that they are found in the pramatter and exchange with it in a complex way. In the model of movement of a pramatter, the material objects should be considered as external factors influencing the pramatter. It is necessary to take into account this fact, using different means, such as a change, in conformity with the constructions being investigated, in the potential of the external forces:

$$F^j\left(l, obj \neq 0\right) \neq F^j\left(l, obj = 0\right).$$

This variant will lead to a change in the right side of the microdynamics equations. It is evident that the standard variant of description of material objects, e.g., the substance atoms found in the pramatter on the basis of the Schrödinger equations can define only very simple situations. Real situations can be very complex, which calls for the use of the generalized microdynamics model.

4. Microdynamics of a moving pramatter

We shall use the hydrodynamics equations for a pramatter in the case where its velocity is nonzero. Let the continuity equation is fulfilled:

$$\partial_1\left(\rho v^1\right) + \partial_2\left(\rho v^2\right) + \partial_3\left(\rho v^3\right) + \partial_0\left(\rho v^0\right) = 0.$$

Then we shall obtain the relations

$$\begin{aligned}
&\rho v^0\partial_0 v^0 + \rho\left(\vec{v}\nabla\right)v^0 - \frac{\eta}{\sigma}\left(\nabla^2 f^0 + \partial_0^2 f^0\right)\\
&\qquad - \operatorname{grad} f^0\cdot\operatorname{grad}\left(\frac{\eta}{\sigma}\right) - \partial_0 f^0\cdot\partial_0\left(\frac{\eta}{\sigma}\right) = F^0,\\
&\rho v^0\partial_0 v^1 + \rho\left(\vec{v}\nabla\right)v^1 - \frac{\eta}{\sigma}\left(\nabla^2 f^1 + \partial_0^2 f^1\right)\\
&\qquad - \operatorname{grad} f^1\cdot\operatorname{grad}\left(\frac{\eta}{\sigma}\right) - \partial_0 f^1\cdot\partial_0\left(\frac{\eta}{\sigma}\right) = F^1,\\
&\rho v^0\partial_0 v^2 + \rho\left(\vec{v}\nabla\right)v^2 - \frac{\eta}{\sigma}\left(\nabla^2 f^2 + \partial_0^2 f^2\right)\\
&\qquad - \operatorname{grad} f^2\cdot\operatorname{grad}\left(\frac{\eta}{\sigma}\right) - \partial_0 f^2\cdot\partial_0\left(\frac{\eta}{\sigma}\right) = F^2,\\
&\rho v^0\partial_0 v^3 + \rho\left(\vec{v}\nabla\right)v^3 - \frac{\eta}{\sigma}\left(\nabla^2 f^3 + \partial_0^2 f^3\right)\\
&\qquad - \operatorname{grad} f^3\cdot\operatorname{grad}\left(\frac{\eta}{\sigma}\right) - \partial_0 f^3\cdot\partial_0\left(\frac{\eta}{\sigma}\right) = F^3.
\end{aligned}$$

If $\vec{v} \neq 0$, $\frac{\eta}{\sigma} = const$, and the scalar additions can be disregarded, the scalar analog of the Schrödinger equation is supplemented with a convective term. Moreover, a vector equation defining the consistent dynamics for the pramatter velocity $\vec{u}$ and the velocity square vector $\vec{Y} = u_x^2\vec{i} + u_y^2\vec{j} + u_z^2\vec{k}$ appears:

$$\begin{aligned}
&i\hbar_1(l)\left(\frac{\partial\chi}{dt} + \left(\vec{u}\nabla\right)\chi\right)\\
&\qquad = -\frac{\hbar_2^2\left(l\right)}{2\rho}\left(\nabla^2\chi - \frac{1}{c_g^2}\frac{\partial^2\chi}{\partial t^2}\right) + 2\Phi\left(l\right)\chi,\\
&\hbar_1(l)\left(\frac{\partial\vec{u}}{dt} + \left(\vec{u}\nabla\right)\vec{u}\right)\\
&\qquad = \frac{\hbar_2^2\left(l\right)}{4\rho}\left(\nabla^2\vec{Y} - \frac{1}{c_g^2}\frac{\partial^2\vec{Y}}{\partial t^2}\right)\frac{1}{c_g} - \frac{1}{c_g}\Phi\left(l\right)\vec{Y}.
\end{aligned}$$

In the new approach, the succession of the practice is retained: in a particular case, the Schrödinger equations are obtained from the macrodynamics equations of a moving matter. In the microdynamics, the scalar wave function of the quantum theory is replaced by the generalized system consisting of scalar and vector functions. In the quantum mechanics, the wave function is not associated with the physical structure of the microworld. In the generalized microdynamics, the functions used should represent the structural properties of the real pramatter. The coefficients of the microdynamics equations should be calculated on the basis of additional equations and experimental data.

In the experiments carried out on a RHIC relativistic collaider of heavy ions at the Brukheiven National Laboratory in 2005, gold nuclei were collided at high energies of the order of 200000 GeV.

An analysis of the experimental data has shown that the viscosity of the strongly interacting quarks and gluons should be very low. At the above-indicated energies, a mixture of quarks and gluons behaves by analogy with an ideal fluid [13]. It seems likely that, at small energies, atoms and molecules behave as the physical systems obeying the microdynamics equations for the pramatter at rest. If the energies are high, it is necessary to take into account the convective and wave terms. Consequently, it may be suggested that the microdynamics equations are substantiated by the experiment at small and high energies. If the energies are higher, the viscous and different force components of the microdynamics may be substantiated.

At relative nuclei velocities close to the light velocity, quarks and gluons represent components of the nuclear matter. The state equations of this system are based on the fundamental Lagrangian of quantum chromodynamics. However, this model can be used only for analysis of the properties of the severe processes of the parton-parton interaction at small distances.

The adron cross-sections consist mainly of mild processes, for which small transfers of a transverse momentum are characteristic. They are usually described with the use of the phenomenological theory [14].

The relativistic hydrodynamis model [15], [16] is a variant of the analysis. The energy density $\varepsilon(x)$, the entropy $s(x)$, the pressure $p(x)$, the tempeature $T(x)$, and the fourvelocity $u^{\mu}(x)$ are determined for the micromatter serving in form of a quark-gluon fluid. The following thermodynamic identities are used:

$$\varepsilon + p = Ts,\ s = \frac{dp}{dT}.$$

In the skeiling hydrodynamics, where one direction is separated along the collision axis, particles are formed on the hypersurface $\tau = \sqrt{t^2 - z^2}$. Then

$$u^{\mu} = \frac{(t,0,0,z)}{\sqrt{t^2 - z^2}},\ p = \frac{\varepsilon}{3}.$$

The expansion of the fluid is determined by the longitudinal flow of a large number of thermal sources, each of which, at $T \geq T_c$, represents a quasi-ideal quark-gluon gas. Its parameters are as follows:

$$\varepsilon_h = \sigma_h T^4,\ p_h = \frac{1}{3}\sigma_h T^4,\ s_h = \frac{4}{3}\sigma_h T^3,\ \sigma_h = \frac{\pi^2}{10}.$$

In the case of cylindrical symmetry of the profile of a fluid flow [17], [18], the velocity profile in the cylinder of variable effective radius $R(\tau)$ is determined, in the hydraulic approximation, by the formula

$$u^r = \frac{dR}{d\tau}\left(\frac{r}{R}\right)^n.$$

Taking into account the “viscosity” of the quark-gluon fluid gives additional nonlinear terms in the equations of motion [19], [20]. If the longitudinal expansion of a viscous quark-gluon fluid is considered, the following equation is obtained for the energy:

$$\frac{d\varepsilon}{d\tau} + \frac{\varepsilon + p}{\tau} - \frac{\chi}{\tau^2} = 0.$$

Here, $\chi(\tau) = \frac{4}{3}\eta(\tau) + \varsigma(\tau)$, $\eta(\tau)$, $\varsigma(\tau)$ are the surface and volume viscosities respectively. An analysis has shown that the viscosity coefficients can significantly increase near the critical temperature of the quark-gluon phase transition [21].

With the use of the relativistic additions, the Schrödinger equation takes the form

$$\begin{aligned} &i\hbar_1(l)\left(\frac{\partial\chi}{dt} + (\vec{u}\nabla)\chi\right) \\ &\quad = -\frac{\hbar_2^2(l)}{2\rho\Gamma^2}\left(\nabla^2(\chi\Gamma^2) - \frac{\partial^2(\chi\Gamma^2)}{c_g^2\partial t^2}\right) \\ &\quad + 2\Phi(l)\chi + i\hbar_1(l)\chi\left(\frac{\partial\ln\Gamma^2}{dt} + (\vec{u}\nabla)\ln\Gamma^2\right). \end{aligned}$$

The microdynamics in the form of hydrodynamics equations becomes much more complex if the dependence of the quantities $\eta^2, \sigma, \rho, \Phi, c_g$ on the coordinates and time is taken into account. The microworld equations become even more complex in the case where the relativistic factors are taken into account: additional expressions characterizing the contribution of velocity dynamics factors into the physical model appear.

5. New answers to the old questions of the quantum theory

We have a solution of the first fundamental problem of physics: a natural correlation between the macrophysics and microphysics realizes in the new model of microefects. It is based on the unique description of different physical levels of a matter. For this model, the difference between the coefficients of the equations and the “wave” functions is natural: this difference is due to the fact that different levels of a matter can have different properties and can exist under different conditions. In the approach developed, a matter and a pramatter have no any fundamental difference, e.g., associated with the properties of the structural components of the new materials.

An analysis of the coefficients involved in the dynamic equations has shown that they represent the energies of one-dimensional physical objects. A view that atons form the main base of a pramatter is natural from the physical standpoint. Their properties and possibilities should be investigated separately.

We have obtained a solution of the second fundamental problem of physics: the microdynamics is written in the tensor form, which guaranties its conformity with the requirement of the general covariance, following from the relativity theory. The model accounts for the velocities corresponding to the physical content of the relativity theory. The earlier apparent insuperable difference between the quantum mechanics and the relativity theory is, according to the approach developed, due to the fact that the incomplete model was analyzed.

We have obtained a solution of the Einstein problem in the quantum theory: the Schrödinger equation used at the initial stage of development of the quantum microdynamics, as applied to the theory of atoms, form only an initial element of the general model. By this reason it cannot be considered as fundamental equation for the whole physics. Their role is aspires by the differential equations for the tensors of velocities and stresses, determined for the matters found at different physical levels. Their mathematical unity gives a stimulus for analysis of the physical unity of the material reality.

We have obtained a solution of the Schrödinger problem in the quantum theory: the complete system of microdynamics equations is not reduced to the scalar-function dynamics. In the complete model, it is necessary to use a vector equation fourvelocities. The microtheory proposed is similar to the electrodynamics. However, it is easy to see that this theory represents a more general model. Actually, it involves convective terms that are absent in the electrodynamics. The indicated model is based on its own fourpotential. This is true because different "wave functions" are used in the models being considered.

The above-described model initiates an activity of physicists. They should find analogs of the "nonisothermisity" for the microdynamics and correctly take into account all other physical factors and circumstances. It is necessary to take into account the "turbulence" in the microworld that is different for different levels of the matter. The model defines the turbulence structure of the microworld: the initial equations involve squares of the pramatter velocities and suggest the fundamental and nonzero turbulence of the multilevel microworld. In particular, one should investigate all the aspects of the pramatter turbulence in the production of new materials. It is necessary to develop a kinetic theory of a pramatter and different physical levels of a matter as well as to analyze their thermodynamic properties and solve the problem on the development of a statistical theory for different levels of the matter.

Conclusions

It is proposed to describe the microworld on the basis of the hydrodynamics equations. It is shown that, in the case where the Lagrangian fourmetric is used for description of a "viscous" pramatter at rest with an interaction dependent on the square of velocities, the generalized Schrödinger equation follows from the hydrodynamics equations. The microdynamics equations were generalized for a moving thin matter.

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