The influence of the Teslar® technology on aqueous solutions modeling rheological properties of liquid homeostasis of human organism

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Abstract. In the framework of the method of "drying drop" we studied the possibility of recording the Teslar chip's radiation (the TC radiation, which originated from the Teslar watch and Teslar bracelet) at the crystallization of strongly oversaturated aqueous solutions. It has been found that the TC very specifically affects the crystallization of the aqueous solution of L-tyrosine, namely, the TC radiation changes the initial structure of the nucleus of a new phase. Considering the creation of nuclei of the solid phase in the aqueous solution of amino acids, we have revealed that the spatial structure of clathrate gel can be governed by external conditions and moreover, the kind of amino acid is not defining. The number of nuclei of crystal and the variety of structures are not large enough and depend on the concentration of dissolved oxygen. Just before the crystallization, the volume of the solution is subdivided to ranges in which the local viscosity has dropped. These ranges play a role of suppliers of building material for high growth chips of the present structure. The laser radiation (0.63 mcm) and the light of visible spectrum do not influence processes studied reproductively. It is suggested that the initial target of the TC radiation – at the mesoscopic level of consideration – is the dynamic structure of 3-D long-living hydrogen bonds saturated by dissolved oxygen.

Key words: Teslar chip, multiplex crystallization, oversaturated solution, L-tyrosine, plasma of blood, hydrogen bonds

1. INTRODUCTION

The goal of the present work is to develop a method of recording the radiation generated by the TC [1]. Such kind of radiation is known in literature under the title "longitudinal scalar waves" that was originally introduced by Nikola Tesla [2]. As consistent with Tesla's idea, the TC generates two co-phased electromagnetic fields of the first harmonic of the Schumann resonance and summarizes them in the counter-phase. A part of the energy generated by the TC is radiated in space in the form of so-called "zero-point longitudinal wave." Since the summation of electromagnetic fields occurs in the near-field region, the difference flow of energy should be determined by the identity of amplitudes and the set-on accuracy of the phase shift. The power P of this flow should be around 10^{-6} W (this value follows from the resources of a battery inside the Teslar watch).

A practice of the therapeutic use of influences of low energy fields on the human organism leads to the conclusion that in the skin and the hypodermic tissue non-specific receptors are available, which responds to magnetic, electrostatic and electromagnetic fields (including the infrared and coherent laser radiation of the visible spectrum) identically [3]. The impact of the enumerated factors makes a demonstration of a quasi-resonance character. In the case of low intensive electromagnetic fields specific "frequency-amplitude windows" or "spectra of action" are available; they depend on such properties, as the kind of sickness, the

place of application and others. In the range of frequencies from 5 to 30 Hz one can suggest that the quasi-resonance phenomenon is associated with the Schumann resonance [4-6].

There are a lot of different approaches to the mechanisms of response of biological objects to a weak local nonspecific stimulus. For a low frequency range of the field influences (approximately from 0.01 to 30 Hz) one can point out two major views on the mechanisms of resonance reaction of the organism to a weak electromagnetic field. Alpha-rhythms associated with a mental activity of the brain or the parametric resonance of some organs or functional systems can be responsible for a primary reception of fields in the Schumann range [7-9].

Independent of the nature of an external agent, a primary receptor of a biosystem should have certain selectivity in order to separate a response from the thermal noise. Besides, the receptor should be embedded near the entrance to an amplifier cascade that ensures a response of the whole organism. At the same time, a local primary response should somehow be transferred to regulator systems of the organism. In the general case, oscillatory biochemical processes, which occur in the organism at any level of consideration, satisfy the above-mentioned requirements. The most important reactions are oxidation-reduction reactions that are associated with the incoming and transportation of oxygen. It is interesting that typical frequencies of these oscillations, i.e. oscillations of cellular and tissue levels, fall within the range of frequencies indicated above – from hundredth parts to several units of Hz. For instance, in two separate studies, researchers Kummer et al. and Fee and Bull showed that oscillatory processes with the participation of oxygen proceeded uninterrupted in cellular and non-cellular water systems [10,11]. Thus oscillatory processes in water systems saturated by oxygen are a well-known phenomenon.

A medical treatment of the TC [12] is associated with its nonspecific influence on the extracellular and intracellular media of the skin and the hypodermic tissue. This means that cells respond to the TC's field. That is why a living cell, as a receptor, can be modeled by an aqueous solution that is found in the vicinity of the phase transition, or a series of phase transitions. Therefore, one of the components of the aqueous solution should be an entity, or entities, that play a significant role in vital functions of a living cell; for instance, such an entity would be an amino acid. The second component of the aqueous solution must be loose oxygen.

In the vicinity of the phase transition, properties of the system in question change sharply and often very abruptly. Besides, the range of these changes is extremely narrow. That is why the behavior of the system and its final state are very sensitive even to insignificant external influences, such as impurities and weak outside fields. Thus the non-equilibrium phase transition as a process (independently from the components, participants) can be both a primary receptor and an amplifier (in the sense of radio engineering) with a huge gain factor.

Since water is the major substance of the human organism, the model receptor of TC's field was constructed by us on the basis of a non-equilibrium aqueous solution of tyrosine and oxygen. A working hypothesis, which should be verified, was the following: A weak external field generated by the TC influences a macroscopic system of fractal gel structures of water clusters, which has to be treated as the primary receptor of this field. In its turn, the appearance of large water clusters should be initiated by dissolved oxygen in the course of consecutive changes to the phase transition of the solution as a whole (the so-called motion of the system in question to spinodal [13]). In particular, the emergence of statistical clusters in water embracing down to 10^3 water molecules was shown by Krasnoholovets [14]. Probably natural water, which includes dissolved impurities, would be treated as a variety of water polymers that comprise "usual" water. A specific architecture of the 3-D water network continuously changes, slaving to surrounding conditions. A driving motive in such processes is the tendency to the most compact packing of separate H_2O molecules.

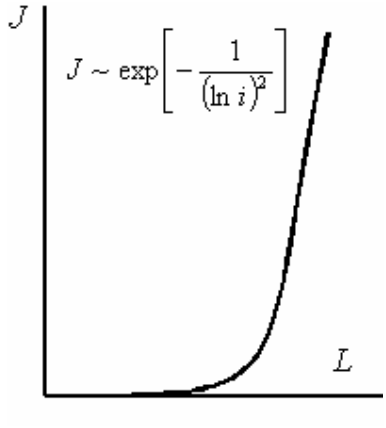

Figure 1. Dependence of the rate of creation *J* of the nucleus of crystal in the aqueous solution as a function of its oversaturation *L* in agreement with the Folmer-Weber-Frenkel model [13].

When a system passes through binodal in the range of metastable phase states, the rate-determining factor for the phase transition is a spontaneous formation of nuclei of new phase of the critical size. A metastable phase can practically exist an unlimited time, because the probability of creation of a nucleus of new phase is negligibly small. However, any alteration of external conditions can induce an impetuous phase transition owing to the sharp dependency of the rate of formation on the degree of metastability, Figure 1. In other words, the "forced" formation of the nucleus of crystal is only possible when the oversaturated solution experiences a non-thermodynamic influence. To overcome the barrier, one should affect a small part of the system.

Such kind of phase transition takes place in the aqueous solution when the 3-D network of water clathrates has already been formed and the whole drop of the solution has subdivided to domains with limited convection and diffusive mobility. That is why the form of chips and their location on the surface of the substrate reflect peculiarities of a reaction of the liquid to changes of external conditions, i.e. the availability or the absence of the TC.

This reasoning has formed the basis of the method of crystallization of strongly supersaturated solutions of L-tyrosine in the geometry of an evaporating drop [15,16].

The geometry of experiments has been chosen in such a way that they have resembled the conditions of a human subject actually wearing the Teslar wristwatch on the wrist.

2. THE IDEA OF EXPERIMENT

As a recorder of the radiation of the TC we chose the water medium situated at non-equilibrium conditions. A physical process susceptible to outside conditions belongs to the first-kind phase transition and in our case this is the total crystallization of the supersaturated aqueous solution of amino acids, first of all – tyrosine. We chose tyrosine due to its specific three-dimensional molecular structure. Although on the nanolevel scale the geometric combinatorics proposes a variety of possible permolecular structures for tyrosine (rings, chains and their combinations), tyrosine at the normal conditions of crystallization forms either linear (needle-shaped forms) or lamellar macrostructures.

At the conditions of a weak non-specific influence of the TC we hoped to reveal changes in the regime of crystallization, namely, when one kind of the structure should be transformed to the other kind (for instance, the needle structure is transformed to the lamellar one).

Spinodal decay of the non-equilibrium system has been induced due to the increase of the concentration of the solute at the evaporation of molecules of the dissolvent, i.e. water, at the constant temperature and pressure.

A directional change of conditions of the crystallization has been ensured by the dosated concentration of oxygen dissolved in the solution. The point is that oxygen plays a very considerable controlling role in the human organism. First, from the viewpoint of biochemistry and bioenergetics, oxygen, as an oxidant of glucose, assigns the absolute value of energy-release in cells owing to the aerobic process. Second, at a typical physiological concentration of oxygen in the blood the viscosity of the blood is defined by cross-linking properties of oxygen [17]. This means that all the parameters of diffusion-transport processes, which determine vital functions in the biological tissue, also strongly depend on the concentration of oxygen.

These are the reasons that have impelled us to use, as model systems, binary aqueous solutions of amino acids plus oxygen.

3. METHODS AND SETUP

Having ensured the identity of conditions of evaporation of drops studied, we have endured the drops in a transparent pressurized cabin made of organic glass. The sizes of the cabin are the following: 80 cm × 60 cm × 60 cm. The interior atmosphere has been supported at a constant humidity, approximately 12%. Phosphoric anhydride P_2O_5, as an absorbent, ensured these conditions in the cabin. Test and control specimens were put within the cabin. A physical configuration of the cabin with the Teslar watch and control specimens is shown in Figure 2.

Figure 2. Physical configuration of the transparent pressurized cabin with the Teslar watch(es) and control specimens. All the experiments that studied the influence of the TC on the crystallization of amino acids were performed in this cabin.

To estimate the data scattering, we made 3 to 5 control specimens for one test specimen.

To reduce outside factors, which were out of control (illumination, vibrations, atmospheric pressure, temperature and so on), we started to experiment on specimens in two time intervals: at 1:00 P.M. and 6:00 P.M. by our local time. The photographing of deposits/foots, the visual analysis and the description of the pattern available were made the next day.

Specimens were made in the following way: The base, i.e. initial, solution of L-tyrosine (produced by the firm "Sigma") was the aqueous solution saturated at 30 ^{o}C, which had the excess of a crystal phase. It was assumed that the concentration of the solute did not change with time in the temperature interval 20 to 25 ^{o}C.

Immediately before the beginning of the experiment the base solution was mixed with the guided solution, or the structure forming aqueous solution, in the proportion required. The latter (i.e. aqueous solution) was made on the basis of green bidistillated water, hydrogen peroxide (H_2O_2), decomposing catalyst (dipotassium chromate, $K_2Cr_2O_7$) and refined and frozen plasma of the human blood. In guided solution the quantities of hydrogen peroxide and dipotassium chromate were chosen such that the concentration of dissolved oxygen was equal to 3×10^{18} cm^{-3} one hour after the experiment start and 5×10^{18} cm^{-3} three hours after the experiment start. Plasma was taken from the same source for all the experiments. We used 1%-aqueous solution of plasma with the initial oxygen concentration equal to 7.3×10^{17} cm^{-3}.

From 10 minutes to 3 hours after mixing (at which time the solution was at equilibrium), we dropped the solution in the center of a special substrate. By means of a batcher we made drops in 37, 74 and 111 milliliters in volume. The preliminary exposure was needed to generate in the solution the concentration of oxygen pointed out above. Drops in volume 37 milliliters were most suitable for the experimentation, because in this case the coefficient of watering of the substrate guaranteed lack of motion of the drop boundary during the time of the drop evaporation.

The most convenient substrate (in sense of the reproducibility of measurements, the quality of the surface of substrate and easy photographing in the reflected light) were parts of floppy discs used in computer technologies. We cut undercoats with the diameter 8 mm from a newly extracted floppy 3.5".

In the case of a test specimen, the substrate was put onto a 'window' of the Teslar watch, so that the drop studied was exactly above the TC (see Figure 3). Such geometry modeled a prolonged influence of the TC on bio-tissues of the wrist. In some experiments control specimens were also put onto a 'window' of the Teslar watch in which the batteries were taken out; however, it was recognized that such action was rather needless. At all times, control specimens were located a minimum of 20 cm from test specimens (i.e. from the TC).

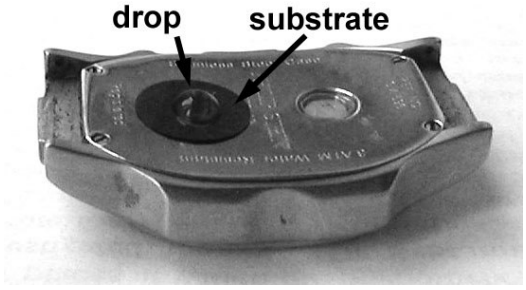

Figure 3. Geometry of the location of the evaporated drop on the 'window' of the working Teslar watch.

The time of complete evaporation of a drop varied from 4 to 5 hours, though the process of the formation of crystals as such (i.e. the growing of a solid phase) did not exceed 10 seconds! It happened at the moment when the largest part of the surface of the specimen under consideration had the flat form and the thickness of layer was no more than 0.4 micrometers.

Photographing of the pattern of distribution of formed chips in the solution was carried out by a digital camera through the laboratory microscope МИ-12А in the reflected light at the magnification 30 to 60.

4. RESULTS

In a series of the experiments performed we have studied:

a) the influence of the TC on the crystallization of NaCl (the concentration of physiological solution);
b) the influence of the TC on the crystallization of glucose (the concentration from physiological to 1%-'s);
c) the influence of the TC on the crystallization of tyrosine in the oxygen-free solution (in the nitrogen atmosphere);
d) the influence of the TC on the crystallization of tyrosine in the oxygen-free solution of plasma of human blood with the concentration 5×10^{-3} %;
e) the influence of the TC on the crystallization of tyrosine in the solution of H_2O_2 with different concentrations of oxygen (with catalysts $K_2Cr_2O_7$ or plasma of human blood);
f) the influence of the laser radiation ($\lambda = 0.63$ micrometers) on the crystallization of tyrosine in the solution with the concentration of oxygen 3×10^{18} cm^{-3};
g) the influence of the inhomogeneous magnetostaticfield on the crystallization of tyrosine in the solution with the concentration of oxygen 3×10^{18} cm^{-3};

In the experiments a) and b) the concentration of dissolved oxygen was close to the saturated value at the temperature 20 to 24 ^{o}C. The method of dripping described above and the evaporation of the dissolvent ensured the 100%-reproduction of the general pattern of foots of the substance. The number of centers of nucleation at the employing NaCl as a solute was proportional to the initial quantity of oxygen in the solution. Glucose does not give separate crystals at same conditions, but forms a glassy film. Any changes under the action of the TC have not been fixed for these two systems.

In the experiment c), when oxygen is out of the solution, the crystallization occurs with the formation of linear macrostructures. It is interesting that the ratio *length : diameter* in a separate crystal depended on the degree of oversaturation of the solution (i.e. the initial volume of a drop) and reaches the value of 800. That is, at the thickness of solution on the substrate close to 8 to 10 micrometers the length of regular crystallite cylinders has reached 5 to 10 mm. It seems that if one attains the threshold degree of the oversaturation, the length of linear structures is limited only by geometric sizes of the system. It is interesting to note that crystals being formed in a short time at moments of the phase transition already in the liquid phase still preserve their spatial locations at the complete evaporation of the dissolvent.

The variation of the initial concentration of tyrosine at these conditions does not change the pattern described qualitatively.

The influence of laser radiation, magnetic field and the TC has not been revealed.
As a demonstration of aforesaid in Figure 3 (two upper pictures) we show photographs of the central part of undercoats: the left picture was formed under the influence of the TC, the right picture was formed without the TC. Nevertheless, we must recognize that the concentration of crystals in the zone affected by the TC (the left picture) is indeed slightly lesser, however, the kind of the structure is completely the same. That is why we suppose that the TC does not influence at this family of conditions.

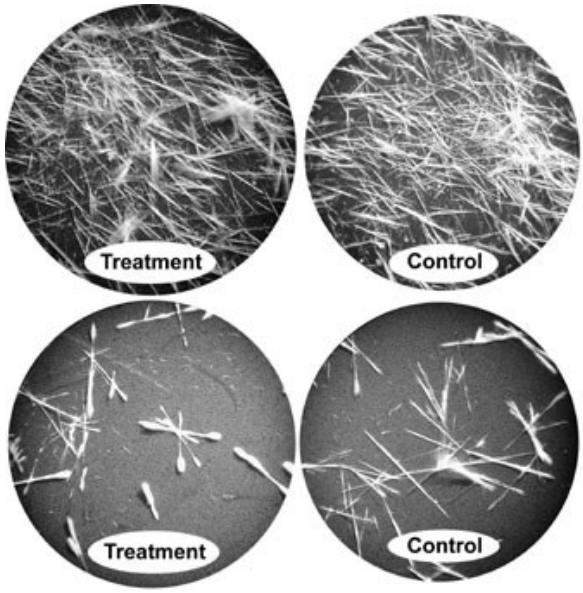

Figure 4. Upper pictures: Typical pattern of the distribution of needle crystals of tyrosine in an oxygen-free medium: affected by the TC (left) and without the TC (right). Lower pictures: Typical pattern of the distribution of "ruff"-kind crystals of tyrosine in an oxygen-free medium with the plasma of human blood: affected by the TC (left) and without the TC (right). Magnification 37×.

In the case d) of crystallization of tyrosine in the oxygen-free solution with micromole supplements of plasma of human blood the kind of the structure of single crystals changes very remarkable. Crystals become similar to "ruffs": The end part of a ragged cylinder crystal is covered by regularly packed smaller needles directed under the angle of 55 degrees to the axis of the cylinder. Such a shape appears around the total volume of the medium, which means a specific package of tyrosine molecules in a nucleus. Only a special study will allow us to clarify which of the plasma components assigns this organization to the center of nucleation. In Figure 4 (two lower pictures) one can see comparative patterns of crystals affected by the TC (left) and without the TC (right): no apparent difference.

The influence of the TC has been revealed only in systems containing oxygen in an extra concentration; this is the case e). In Figure 4 we present an example of a quantitative change of the crystallization caused by the influence of the TC (the left upper picture). Due to the TC's field crystal structures strongly enlarged and their quantity correspondingly decreased. Nevertheless, their form is still preserved. In Figure 4 we show also other crystal complexes that aroused in other places of the substrate in this experiment (without the TC); these pictures are added to give a demonstration of the repeatability of identity of initial conditions at the

approach to the phase transition. We already have mentioned that for each solution exposed to the TC, we also used 3 to 5 control specimens of that same solution that were not exposed to the TC.

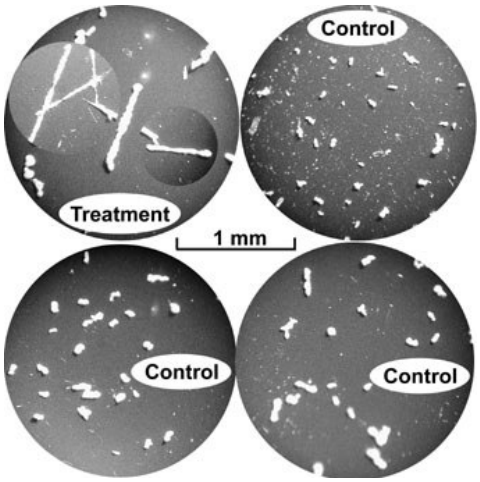

Figure 5. Photographs of typical structures of crystallization of tyrosine at the initial concentration of H_2O_2 equals 1.2×10^{18} cm^{-3}; the concentration of the catalyst $K_2Cr_2O_7$ is 2.0×10^{15} cm^{-3}. The solution stood for 1.5 hours before dripping on the substrate; the volume of the drop was 37 microliters. Magnification 37×.

In Figure 6 we give a demonstration of the natural reaction of a non-equilibrium medium to the influence of the TC (the left upper picture; the three other pictures are control). In this experiment the initial (extra) concentration of oxygen is two times larger than its typical regular concentration. We see that in this case forms of macrostructures have radically changed. The overwhelming majority of macrostructures represent pairs of elements from the previous experiment bound together.

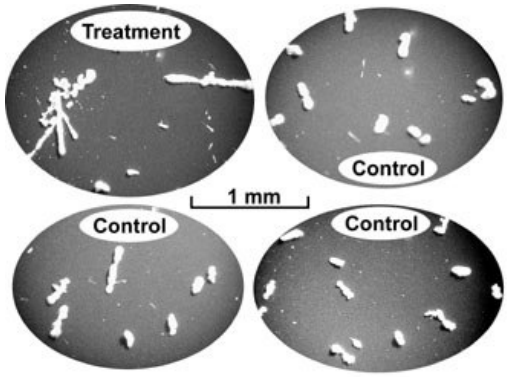

Figure 6. Photographs of typical structures of crystallization of tyrosine at the initial concentration of H_2O_2 equals 1.2×10^{18} cm^{-3}; the concentration of the catalyst $K_2Cr_2O_7$ is 2.0×10^{15} cm^{-3}. The solution stood for 2.5 hours before dripping on the substrate; the volume of the drop was 37 microliters. Magnification 37×.

The most significant difference of test specimens from control specimens has been obtained at non-monotone changes of the concentration of oxygen in the solution: initially the concentration increases and then decreases, Figure 7. When we used the catalyst $K_2Cr_2O_7$, a radical change occurred in the medium structure in the center of the substrate – just above the 'window' of the Teslar watch. We can see the crystal structure gigantic on the microscopic scale. The platy structure has formed only in the place located just across the 'window' of the Teslar watch. In other places of the specimen the structure of crystals are identical to that of the control; plate structures did not emerge in the control. This result points to the threshold character of influence of the TC: Changes in the medium occur locally in the zone of maximal intensity of the radiation.

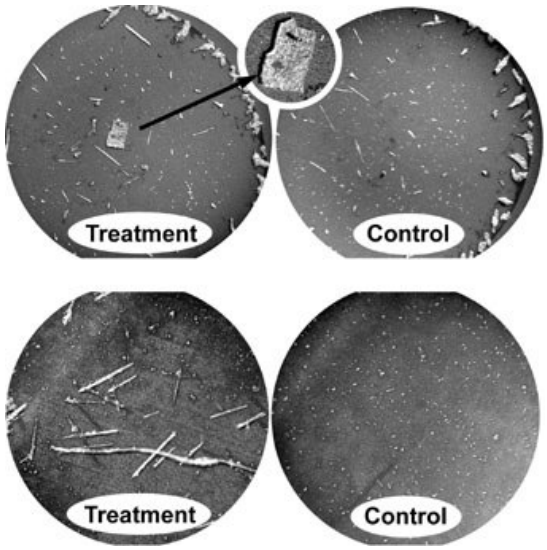

Figure 7. Photographs of typical structures of crystallization of tyrosine at the initial concentration of H_2O_2 equals 1.2×10^{18} cm^{-3}. The solution stood for 10 minutes before dripping on the substrate; the volume of the drop was 37 microliters. Magnification $37\times$. Upper pictures were taken from specimens in which $K_2Cr_2O_7$ (concentration 1.0×10^{15} cm^{-3}) played the role of the catalyst. Lower pictures were taken from samples in which the 1%-solution of plasma of human blood played the role of catalyst.

Regarding items f) and g) we have to note only that no influence in specimens on the side of laser radiation and magnetic field has been observed.

5. DISCUSSION

According to the conventional theory of crystallization, crystals are growing by the trial-and-error method: the solute's particles being in a mother medium try to embed themselves with a frequency $\sim10^{13}$ s^{-1} in a crystal. In the state of extreme supersaturation we in fact observe regular flows of the solute's molecules that are guided by the mean field

potential to new locations, as if they have already been prepared. The structure of these microscopic flows is assigned by the prehistory of the system, or more exactly, the spatial distribution of the average "force of hydrogen bonds". Such parameter could determine the so-called structure of solutions.

A comparative analysis of processes of crystallization, which occur in the solution without the TC and with the presence of the TC, has allowed us to reveal the importance of oxygen as a stimulator of the crystallization. The study in crystal morphology correlates well with parameters of viscosity of the medium and enables one to treat the medium in question as a self-organizing system. At the spinodal decay the number of centers of nucleation are given by the viscosity of a medium, but the structure of nano- and meso-volumes around this or that center of nucleation is determined by the prehistory of the system and applied fields, which may play a role of a control factor.

In the extremely supersaturated aqueous solution of amino acids, when the spontaneous creation of a nucleus of crystal takes place, the spatial structure of a primary nucleus can be regulated by outside conditions and therefore the kind of the amino acid is not determinative.

The number of centers of crystallization is comparatively small, the same as the quantity of kinds of structures. These parameters strongly depend on the concentration of dissolved oxygen.

Approaching the total crystallization, the volume of the solution is subdivided to ranges with equivalent ordering. These are the ranges that become suppliers of building material for growing crystals of appropriate structures. At the evaporation of the aqueous solution of NaCl (physiological concentrations) the role of oxygen at the formation of gel structures of water clathrates is well-marked. The lesser concentration of dissolved oxygen, the lesser number of NaCl chips, which also has been observed in prior research [18]. Basically NaCl chips are located in the periphery of the drop. The same pattern is observed when we deal with the solution of tyrosine. In a degassed solution the length of tyrosine needle-shaped chips is restricted only by the drop size. It seems that without any acoustical and mechanical perturbations and dissolved oxygen the length of such liner formations can be prolonged to tens of centimeters and longer.

It should particularly be emphasized the absolute linearity of needles and a huge ratio length/diameter, which reaches 1000 in largest drops. If we take into account that the process of spinodal decay and sedimentation of the solid phase occurs very rapidly, the picture of formation of the linear attractive range looks like a shot from a revolver.

At the concentration of oxygen in a salt solution considerable with that in the arterial blood, the number of centers of primary nucleation increases 10 to 20 times. Correspondingly, the mean volume of a chip decreases. One can say that oxygen and salt act on a local viscosity of the water system in the counter-phase.

If we substitute NaCl for glucose, in the range of the mass concentration 0.1% to 1% glucose will be precipitated in the form of glassy glue. This signifies that glucose actively participates in the formation of clathrates structures of micro- and macroscopic scales.

6. CONCLUSION

Laser radiation (0.63 mcm), visible light and magnetostaticfield with the magnetizing force 10 to 40 Oersted do affect the crystallization process such that the process may be slightly different with repeated attempts.

The character and distribution of the crystal sediment point out that the dynamic structure of fractal gel water clathrates should be considered as the primary target of the Teslar chip's field. This conclusion is in accord with the result obtained in prior research on the TC [19].

The field of the TC specifically influences the crystallization of aqueous solution of L-tyrosine: It changes the primary structure of nucleus of crystal. The reproducibility is 100% in comparison with control specimens; however, the degree of influence and the signal directivity of the TC have varied from experiment to experiment.

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