Nanoluminescent Scanning Optical Microscope for the Microorganisms Functioning Research under the Low Temperatures Influence

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Abstract – **The ways of a nanoluminescent scanning optical microscope (NSOM) construction for the microorganisms functioning research under the low temperatures influence are considered.**

Keywords – **Scanning microscope, Nanoluminescence, Cryogenic engineering, Temperature measurement, Microobject image formation.**

I. Introduction

At the microorganisms' research in the Biology by the warming-freezing methods the necessity of the object preservation after carrying out of all expected researches procedures without reception of its irreversible damages to its structure and ability to live appears. For the biological objects research both optical and electronic microscopes are in use. Proceeding from a principle of the action optical microscopes has restrictions of increase and resolution useful scale. These restrictions are connected to the light wave nature. Electronic microscopes for the work demand the presence of vacuum, which is destructive for the biological objects. Nowadays the applied methods of microorganisms' research do not allow their temperature measuring during freezing-warming. This article authors suggest NSOM creating, which will unite opportunities of useful scales reception of increase and resolution, commensurable with initial values of scanning electronic microscopy and the natural environment of the biological objects existence, inherent in optical microscopy.

II. Nanoluminescence microscope

The necessity of this work accomplishment connected with the necessity of the additional information receiving about micro-objects' parameters during the biological objects freezing-warming process. The principles of the NSOM creation with the controlled cryostat for the microorganism's fragments temperature identification by the direct input inside the functional biologically tolerant nanoparticles are developed. These particles under the low dynamic temperatures influence by the NSOM light probe radiation have to change their radiation parameter depending on the freezing degree. These parameters analysis allows to identify the researched microorganism's separated fragments temperature during the freezing-warming process.

The freezing-warming process will happen with the microorganism condition's direct visual supervision by the NSOM support. During the freezing-warming process the necessity of the dynamic microorganism's and it's separated fragments temperature measurement arises. This task should be solved by the input into the microorganism the functional luminescent biological tolerant nanoparticles, which luminescence parameters depend on a freezing-warming process. The scanning-optic microscopy allows analyzing the luminescence parameters, such as intensity, spectrum, after-lighting endurance, which further will be used for present temperature identification during the freezing-warming process.

Nowadays existing microorganisms collecting methods (such as liofilization, cryo-conservation, drying etc) are used unequally. Last years the conservation by low temperatures is preferable. In this case is important the possibility of the continuous supervision by NSOM means to the microorganisms cells changing, which lead to the physiological properties changes in the low-temperature treatment process. The interdependence between these changes ascertainment could allow researching the protection mechanism in favor of the microorganisms vulnerability modification to the stress factors, including complicated and durable biochemical researches. The promising is the microorganisms cultures conservation optimal conditions identification (such as temperatures interval, environment, cells age etc) by low temperatures, which allows to preserve their important functional properties.

Biotechnologies require more and more perfect preparations, which could help to identify, to separate and to investigate the variety of the biological objects, such as protein, stem, yeasty or pathologic cells and microorganisms. One of the profits of the rare-earth elements implementation is the possibility to use the physical methods to it detection. Exactly the possibility of this complexes or nanoparticles, which consist such cations, is implemented for creation on their basis the analytical reagents for the Biology and the Medicine. Owing to the implementation of this combination in the various branches of the Chemistry, Physic, Biology, Medicine, the metal-complexes almost with all Periodical System's metals are received [1]. Such combinations are used as the radical processes initiators, to the polymers with unique physical-mechanical properties receiving [2].

However, still too little are described the researches of the synthesis and the implementation for this aim the reactive-able functional combinations, which are capable to the luminescence and to the interaction with the biological objects simultaneously. In the literature much more attention is devoted to the metal-complexes synthesis, which are used to the controlled radical polymerization conducting to the specified-properties polymers receiving [3]. A lot of researching is conducted of the polymer metal-complexes

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synthesis with the rare-earth elements cations as well as these combinations investigations as the bioassay reagents [4]. In the research [5] are described the ways of receiving the olygoperoxyd metal-complexes of the metals with the fluent valency and the innovation radical polymerization processes.

The luminescent olygoperoxyd metal-complexes implementation attractiveness contains it the fact that this substances and the developed by us such methods of their implementation as the radical polymerization and the polymer-analogical transformations provides the solid design of their construction and the colloid-chemical, chemical and special physical properties according to the implementation aim and branch.

The yeast are used to the production of: beer, ethyl alcohol, strong drinks, fruit-berry and grape vines, organic acids, ferments, vitamins; for the baking of bread and bakery; biomass receiving as the feeding additive to the farming animals basal ration. With the help of the yeast the sewage is treating.

The intensive researches are conducing on the field of the new industrial yeast strain receiving, which could be good to ferment sugars into alcohol and are stable to the conditions changed (alcohol production), to preserve the ferment activity and the good settling rate (brewing) [6], to have a good adaptation to the substances, which are in the grape must (wine-making), to accumulate fast the biomass (yeast-making, food protein making and other food-additions). Consequently still is urgent the task of researching the ways of industrial yeast strains conservation, which could provide with the properties preservation and reproduction, valuable for the products fermentation technologies and for the other branches of food production.

The NSOM with controlled cryostats for a microorganism fragment temperature definition is offered, by direct introduction in it the functional luminescent tolerant nanoparticles. These nanoparticles under the influence of low dynamic temperatures at an irradiation their light probe change parameters of the radiation depending on a degree of cooling. The analysis of parameters changes of radiation biologically tolerant nanoparticles realizations during transformation light radiations in an electric signal.

Considering the preliminary calibration in a microscope it is possible to define the researched microorganism's separate fragments temperature during freezing-warming. The freezing-warming process occurs at an organism condition continuous visual supervision on the screen monitor which is a NSOM part.

As a result of execution work will be:

- a new way is developed of a microorganism fragment current temperature measurement during freezing-warming at simultaneous supervision of a microorganism structure;
- the controlled cryostat for microorganisms freezing-warming is developed;
- the problem of heat removal is solved at microorganisms freezing-warming in NSOM from small volume on microscope a little table;
- the signal parameters of the induced photoluminescence nanoparticles, which are suitable for use at measurement of temperature, are determined;
- the technique of the freezing-warming temperature measurement accuracy increasing is developed due to the induced photoluminescence signal processing;
- the technique of the researched object temperature calibration is developed at freezing-warming;
- is developed a new functionally biological polymer-mineral nanoparticles, with the set sizes and distribution on the size, controllable parameters of the nucleus luminescence and the set environment functionality;
- dependence on a luminescence parameters (wave length of a maximum of a luminescence and afterglow duration) from the sizes nanocomposites, the mineral or organic nucleus nature, the functional environment nature, excitation wave length and temperature are determined.

III. Conclusion

During the work execution will be: 1) the NSOM with controlled thermostat created, which allows to use photoluminescence functional biologically tolerant nanoparticles for temperature measurement of researched organism fragments during freezing-warming; 2) the dependences on the characteristics of a colloid-chemical and biological properties nanoparticles luminescence by nature luminophore, the particles sizes and functionality are determined; 3) the preservation problem of the proof morphology-structural and physiological properties is solved during various ways of storage (preservation).

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