Light Scattering Properties of Peptone Solution

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Abstract - **The results of researches of light scattering properties of peptone liquid solution for the bacterial cells of Escherichia coli is described.**

Keywords – **bacteria, solution, peptone, light scattering.**

I. INTRODUCTION

Basic from a component of cultural mediums for cultivation of Escherichia coli bacterial cells is a peptone. Cultivation of bacterial cells is accompanied heat treatment of nutrient medium. As a rule, cultivation of cells takes place during a few hours at a temperature 37°C, and sterilization of solutions at a temperature 121°C during 15-20 minutes. Different temperature conditions must result in destruction of nutrient mediums, and to the change of them physical and chemical properties. An of attempt in number to estimate thermal destruction of peptone on changing of light scattering properties him water solutions is done in this work. This of estimation was conducted by determination of the size distributing and concentration of parts in water solutions of peptone, citizen heat treatment.

II. PARTICLES' SIZE DISTRIBUTION METHOD

Authors of are develop the new method of determination of the size distributing of particless, device and method, for measuring of kinetics of reproduction of microorganisms [1 - 2]. In of the suggested method registered by optoelectronic devices particle is characterized by such parameters as amplitude and duration of impulse. Distribution of particles by sizes is determined from the measured functional dependence of number of registered particles from amplitude and duration of the proper electric impulses on the output photoreceiver. Given of dependence within limits of statistical errors repeats in case of conducting measurement series in the medium with identical optical parameters. It of is linked by functional dependence to relative particles' fraction of different sizes, that is with the size distribution, which is expressed by first kind integral of Freudgolhm of equation. Problem of particles' size distribution determination by measured functional dependence is improper, and it's solution requires special methods. In of practice, solving of integral equation is reduced by discretization to system of linear algebra equations set. Matrix of determination of this system and vector of measured dependence of impulses number from duration and amplitude is .

Consequently, within the framework of taken model, the problem of size distribution determination is reduced to finding vector x by solving system of linear algebra equations which can be written down as matrix:

$$Ax = b \qquad (1)$$

b is and vector of results of measuring the components of which determine from the matrix of distributing of dissipated of light scattering impulse, registered after their amplitude and duration: A - of matrix the elements of which determine at and graduation.

Determinations of veritable concentration of particles of different sizes conduct after the values of coefficients of counting . In of general case, the task of determination the size distributing (1) is improper after of Hadamard of and for the search of its decision apply regular methods. In of this case for untiing the systems apply regularizational
iteration process on and next chart. The of first approaching is calculated on and formula:

$$\tilde{x}_1 = \left(A'A + \alpha\Omega\right)^{-!} A'b. \qquad (2)$$

Next of iteration are conducted analogically. On of n +1- step we will get:

$$\tilde{x}_{n=1} = D_n(A'AD_n + \alpha\Omega)^{-1} A'\tilde{b}, \qquad (3)$$

where of A' – transposed matrix of A and
$D_n = diag(\tilde{x}),$

$$\Omega = \begin{bmatrix} k-1 & -1 & .. & -1 \\ -1 & k-1 & .. & -1 \\ .. & .. & .. & .. \\ -1 & -1 & .. & k-1 \end{bmatrix},$$

α - parameter of regularization.

The of number of iterations is determined after and criterion of L-curve. For of this purpose build dependence of misclosure of iteration process on the norm of result. The of criterion of stop of iteration process is and number of iterations, at which speed of change of misclosure stops substantially to change at continuation of iteration process. For of this purpose conduct an iteration process with the large enough number of iterations. Determine of the optimum number of iterations. Conduct of repeatedly an iteration process with the certain number of iterations.

These results testify that in the process of cultivation of bacterial cells in nutrient medium, which contains water solution of peptone, both the number of bacterial cells and concentration of particles of unmicrobal nature must change. Therefore, for the increase of exactness of measurings, it is necessary to conduct the parallel measurings of concentration and sizes of particles in an medium without the brought in microorganisms, and to take into account the results of these measurings at treatment.

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