WORLDLY KNOWLEDGE
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCHERS
ISSN : 3030-332X IMPACT FACTOR (Research bib) – 7,293

COMPUTER MODELING OF SELECTIVE COATINGS

Sh.Q. Nizomova
Assistant at the Department of Biophysics
Innovative and Information Technologies in Medicine
Bukhara State Medical Institute named after Abu Ali Ibn Sina.

Abstract: Renewable energy is an internal resource of any country that has sufficient potential to produce the necessary energy to fully or partially supply it. Solar energy is the cheapest and most environmentally friendly form of renewable energy sources (QTEM). Due to the increase in the demand for electricity in the republic, there was a need to increase the production of electricity. The development of solar energy in Uzbekistan will help meet the demand for electricity without burning fossil fuels and thereby reduce greenhouse gas emissions. In addition, solar energy helps to develop the country's industry, create new jobs, increase the level of electricity supply and fight against climate change.
Key words: Kata solar oven, vacuum devices, reflectance photometer, spectrophotometer (Lamda).

Based on the computer modeling of selective coatings, the plane wave approximation is based on recurrent formulas obtained by solving the stationary wave equation [1, 2]. Modeling of the optical properties of selective absorbing coatings containing absorbing layers does not always lead to adequate results due to the fact that the final expressions for reflection and transmission amplitude coefficients include rapidly oscillating functions. In such systems, the interference condition is violated due to the presence of absorbing layers or thick weak absorbing layers. For example, the surface selectivity of thermal solar devices is provided by a system of several films: an aluminum layer, an absorbing and clarifying (prosvetlyayushchego) layer. The thickness of the absorbing layer d is usually greater than the wavelength of the incident solar radiation λ. Such without , coherence conditions broken because , such in systems interference appear it won't be . That's why for , to include win receiver layers entered selective win receiver of coatings optical features modeling for we matrix method (transfer matrix method) we chose . In this way j-1 on the border electricity of the normal component of the area value j at the limit electricity the normal component of the area linear change the way with is taken :

$$\begin{matrix} E^{(t)}_{(j-1)^-} \\ E^{(r)}_{(j-1)^-} \end{matrix} = \begin{matrix} \dfrac{\exp(i\varphi_j)}{g_{j-1}} & \dfrac{f_{j-1}}{g_{j-1}}\exp(-i\varphi_j) \\ \dfrac{f_{j-1}}{g_{j-1}}\exp(i\varphi_j) & \dfrac{\exp(-i\varphi_j)}{g_{j-1}} \end{matrix} \begin{matrix} E^{(r)}_{j^-} \\ E^{(t)}_{j^-} \end{matrix} \quad (1)$$

$$f_{j-1} = \frac{N_{j-1} - N_j}{N_{j-1} + N_j}, \qquad g_{j-1} = \frac{2N_{j-1}}{N_{j-1} + N_j} \quad (2)$$

Here: $\mathbf{N_j}$, $\varphi_j = \dfrac{2\pi}{\lambda} N_j d_j$, $\mathbf{d_j}$ is the complex index of refraction, phase and geometric thickness of the **j -th film.** The convenience of the matrix notation consists in the simplicity and compactness of the recurrent procedure connecting the components of the wave field at the boundary of the separation of media. By successively applying (4), the electric field of the reflected and transmitted waves by the incident medium, taking into account the boundary conditions at the boundary of the final film-substrate separation, i.e. at the **m -th boundary** amplitudes can be obtained in the following form:

$$\frac{E_{0^-}^{(t)}}{E_{0^-}^{(r)}} = M_1 M_2 M_3 \ldots M_{m-1} \frac{E_{(m)^-}^{(t)}}{E_{(m)^-}^{(r)}} = M \frac{\frac{1}{2}\left(1+\frac{n_m}{n_{m-1}}\right)}{\frac{1}{2}\left(1-\frac{n_m}{n_{m-1}}\right)} \qquad (3)$$

где $M = \prod_{j=1}^{m-1} M_j$

Complicated a lot component of the environment optical model choose

Oxides in the mixture of metals one carbonaceous repetition the way with received nanocomposite the material kept selective win receiver of coatings optical features There is a lot of forecasting (modelling). component of systems optical features descriptive adequate mathematician the model without creating it won't be . Model a lot component of systems optical constants or dielectric of the function of components concentration and optical to constants dependence account take need

Current at the time a lot component dispersed of systems dielectric features classification their spatial structure external to the sign according to done is increased . In space chaotic fluctuating dielectric constant statistics systems , as well as dielectric functional $\boldsymbol{\varepsilon_1}$ dispersed phase **1** (filler) particles $\boldsymbol{\varepsilon_2}$ dielectric functional in a continuous dispersion environment **2** (matrix) is distributed matrix systems there is . If appropriate of components volume shares $\boldsymbol{f_1}$ and $\boldsymbol{f_2}$ if , then static system for dielectric function $\boldsymbol{\varepsilon_2}$ his own to the components relatively symmetrical will be $\boldsymbol{\varepsilon_m} = \varphi(\varepsilon_1, \varepsilon_2, f_1, f_2) = \varphi(\varepsilon_2, \varepsilon_1, f_2, f_1)$, ie **1** and **2** phases equivalent will be Matrix system in the situation dispersed phase and dispersed environment equivalent no , that's why for indexes when it changes $\boldsymbol{\varepsilon_m}$ of the function shape changes (phases inversion): $\boldsymbol{\varepsilon} = \varphi(\varepsilon_1, \varepsilon_2, f_1, f_2) \neq \varphi(\varepsilon_2, \varepsilon_1, f_2, f_1)$. Disperse phase concentration increase with matrix system little by little statistics to the system approaches , from the components one when it decreases while statistics system priority from the component matrix with matrix to the system approaches .

Contains three component : metal and two oxide has been nanocomposite of the material optical features of components concentration and optical to constants depends will be That's why for three component environment optical features modeling for Bruggeman effective environment model was selected [3]. General in the case of the composition **m** component entered statistics system Bruggeman's formula for in the sheep to look has :

$$\sum_{i=1}^{m} f_i \frac{\varepsilon_i - \varepsilon_m}{\varepsilon_i + 2\varepsilon_m} = 0, \qquad \sum_i f_i = 1 \qquad (4)$$

Here: $\boldsymbol{\varepsilon_i}$, $\boldsymbol{f_i}$ – dielectric conductivity and volume concentration of the **εi -th component;** $_m$ is the dielectric constant of the effective medium (mixture). Two component environment (oxides mixture) for formula (1). obvious in appearance we write :

$$f_1 \frac{e_1 - e_m}{e_1 + 2e_m} + f_2 \frac{e_2 - e_m}{e_2 + 2e_m} = 0 \qquad (5)$$

$$f_1 + f_2 = 1 \qquad (6)$$

$_m$ from (5).$\boldsymbol{\varepsilon}$ the if we express , then two to the root have has been square the equation we can Three component environment (metal and oxides mixture) for under expression (4). to look has :

$$f_1 \frac{\varepsilon_1 - e_m}{\varepsilon_1 + 2e_m} + f_2 \frac{\varepsilon_2 - e_m}{\varepsilon_2 + 2e_m} + f_3 \frac{\varepsilon_3 - e_m}{\varepsilon_3 + 2e_m} = 0 \qquad (7)$$

$$f_1 + f_2 + f_3 = 1 \quad (8)$$

m from (5) ε, then we have a third-order equation. It is known that a third-order equation with constant coefficients, depending on the discriminant, can have one real and two complex roots, three real roots, two of which are equal to each other, or three different real roots [2].

Thus, the expressions (5) and (7) can be the basis for calculating the dielectric constant (refractive and absorption indices) of the mixture, but there is a problem in choosing the solution of the appropriate equation [4, 5].

Summary.

Based on the analysis of literature and personal experience of modeling complex composite systems, a computer program was created that allows to model the optical properties of selective absorption coatings containing a nanocomposite material obtained by carbon reduction of one of the mixed metals of oxides with sufficient accuracy.

Algorithm based on formulas (5) and (7) , as well as optical measurements mathematician again work lies

- the sun energy be taken methods analysis to do
- vacuum the sun heat collector study
- the sun ovens study
- vacuum on devices compositional coatings to receive in the laboratory study .

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