THE MATHEMATICAL MODEL OF MASS AND HEAT TRANSFER FOR MICROWAVE INSTALLATIONS

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Of increased interest is the research of mass and heat transfer in the drying of vegetable products with the application of microwaves. In the case of dehydration in microwave installations in order to obtain a high yield, the product subjected to heat treatment must be optimally located to the microwave generator (magnetron) to exclude the phenomenon of reflection as much as possible.

For microwaves the reflection from the product must be minimal, this condition is written as:

$$T(x, y, z)|_{y=0} = T_o \tag{1}$$

$$\frac{\partial T^{(x,y,z)}}{\partial x} \left|\frac{\rightarrow}{x = \pm R} = \mp \frac{\varphi}{\lambda_{\text{пр}}} \left(\mathrm{T_п} - \mathrm{T_p}\right)\right|_{x=R} \tag{2}$$

$$\frac{\partial T^{(x,y,z)}}{\partial z} = \pm \frac{\varphi}{\lambda_{\text{пр}}} \left(\mathrm{T_{п-}T_p}\right)\Big|_{z=0;l} \tag{3}$$

Solving the boundary equations for temperature, (1) - (3) by the method of separation of variables is written in the second form:

$$\mathrm{T}=\sum_{m=1}^{\infty} \sum_{p=1}^{\infty} C_{mp}(y) \left[\cos\left(k_{zp} * z\right) - \frac{\alpha}{\lambda_d k_{2p}} \sin(k_{2p} z)\right] \cdot \cos(\, k_{xm} x) \tag{4}$$

For the given boundary conditions:

$$u(x, y, z)|_{y=0} = U_o \tag{5}$$

$$\frac{\partial U}{\partial x}(x, y, z) \left|\frac{\rightarrow}{x=\pm R} = \frac{\beta}{\lambda_m} U(x, y, z)\right|_{x=\pm R} \tag{6}$$

$$\frac{\partial U}{\partial z}(x, y, z) \left|\frac{\rightarrow}{z=0,l} = \mp \frac{\beta}{\alpha_m} U(x, y, z)\right|_{z=0,\ l} \tag{7}$$

Solving the system of equations (5) – (6) for humidity will have the form:

$$U = \sum_{i=1}^{\infty} . \sum_{j=1}^{\infty} A_j(y)\, (\cos\left(k_{zj} z\right) - \frac{\beta}{\alpha_m k k_{zj}} \cdot sin k_{zj} z \cdot cos k_{xi} x) \tag{8}$$

In the design phase of dehydration installations using SHF, the position of the product tray as well as the magnetron is very important, it is recommended to position the product perpendicular to the direction of microwave propagation.

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