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EFFECTIVE METHODS FOR THE SOLUTIONS OF DIFFUSION PROBLEMS IN MULTILAYERED 3D DOMAIN

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The averaging method were applied for the mathematical simulation of the mass transfer process in multilayered underground systems[1; 2]. In this talk we consider the metal concentration in the 2 layered peat block. A specific feature of these problems is that it is necessary to solve the 3-D boundary-value problems for elliptic type partial differential equations of second order with piece-wise diffusion coefficients in two layered domain.Therefore we develop here an effective finite-difference method for solving of a problem of the above type with periodical boundary condition in x direction. This procedure allows to reduce the 3-D problem to a 2-D problems.

The process of diffusion is consider in 3-D parallelepiped $\Omega = \{(x, y, z) : 0 \leq x \leq l, 0 \leq y \leq L, 0 \leq z \leq Z\}$. The stationary 3-D problem of the linear diffusion theory for multilayered piece-wise homogenous materials of N layers $\Omega_i = \{(x, y, z) : x \in (0, l), y \in (0, L), z \in (z_{i-1}, z_i)\}, i = \overline{1, N}, z_0 = 0, z_N = Z$ is descibed by following partial differential equations (PDE)

$$D_{ix}\partial^2 c_i/\partial x^2 + D_{iy}\partial^2 c_i/\partial y^2 + D_{iz}\partial^2 c_i/\partial z^2 + f_i(x, y, z) = 0.$$

Here D_{ix}, D_{iy}, D_{iz}, are constant diffusions cefficients, $c_i = c_i(x, y, z$ – the concentrations functions in every layer, $f_i(x, y, z)$ - the fixed sours function.
The 3D diffusion problem in layered domain are approximate with the 2D boundary value problem for a system of PDEs . This system is solved by the finite difference method.

REFERENCES

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