OPTIMIZATION METHOD FOR TWO-PHASE INVERSE STEFAN PROBLEMS

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Summary: The inverse problems for differential equations consist of stating the initial conditions, boundary conditions or thermophysical properties of the body. But the absent insufficiency of input information is compensated by some additional information on effects of the input conditions. Generally, for the inverse Stefan problem it is assumed, that this additional information is the position of the freezing front, its velocity in normal direction or temperature in selected points of the domain.

The most of known papers concern the one-phase inverse Stefan problems. Papers concerning two-phase problems are not as yet in great number, part of them have of little importance for applications, considering either a way of solution [3,6-8] or semi-infinite domains [6-8,10]. The most of all papers concern problems consisting of reconstruction of temperature or heat flux on the boundary of a domain [1,2,5,15-18]. In the paper [14] the distribution of the inner heat sources in a domain is reconstructed. The inverse Stefan problems, where the thermal properties of materials (e.g. thermal conductivity, thermal diffusivity, coefficient of convective heat-transfer etc.) are reconstructed, are considered in papers [10-13]. Unfortunately all these papers concern the semi-infinite domains, but the two-phase problem is considered only in the paper [10].

In this paper, present a method for reconstruction the function, which describes the coefficient of convective heat-transfer, when the position of the moving interface of phase change is well-known. The method consists of the minimalization of a functional, which value is the norm of a difference between given position of moving interface of phase change and a position having to be reconstructed for a select function describing coefficient of convective heat-transfer. In numerical calculation there was used the optimization Nelder-Mead method [4] and the alternating phase truncation method [9].

References