

# Solution of the free boundary problem for the parabolic equations with unknown temperature and velocity

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**Abstract:** Let  $\Omega(t)$  be a domain in  $\mathbb{R}^n$ ,  $n \geq 2$ ,  $\gamma(t) := \partial\Omega(t)$ ,  $t \in (0, t)$  and at the initial moment  $t = 0$   $\Omega(0) := \Omega$ ,  $\gamma(0) := \Gamma$ .  $\gamma(t)$  is a free (unknown) boundary.

We consider one-phase multidimensional free boundary problem for the parabolic equations in the unknown domain. Let the substance in  $\Omega(t)$  be in a liquid state. The unknown functions determined in  $\Omega(t)$  are temperature and velocity of liquid and they satisfy the parabolic equations. Such problem is a mathematical model, for instance, of the transportation of oil, when there is also a paraffined (solid) oil outside of  $\Omega(t)$ , and the boundary  $\gamma(t)$  between the liquid and solid phases is unknown one.

The existence, uniqueness and coercive estimate of the solution of the considered problem locally in time is proved in the Hölder space.

**Keywords:** Hölder space, parabolic equation, free boundary problem, existence, uniqueness, coercive estimates

**2010 Mathematics Subject Classification:** 35R35, 35K20, 35B65