On the solvability of a transmission problem for the Laplace operator with dynamic boundary condition on a nonregular interface

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Abstract

We consider the linear transmission problem for the Laplace equations on a plane with two peculiarities. The first one is a noregular interface and the second consists in that the one of the transmission conditions contains derivatives of unknown functions with respect to time. So that we study the elliptic problem with a dynamic boundary condition. The results relating to transmission problems with nonregular interfaces can be found in the monograph of S. Nicaise (1993). There are many results concerning to elliptic and parabolic problems with the dynamic boundary condition, which arise under investigation a nonlinear free boundary problem with a smooth interface (the Muskat problem). The mathematical interest to elliptic and parabolic boundary value problems with the dynamic boundary condition is stipulated by applications in physics, chemistry, biology, ets.

Using various analytical methods, we proved the existence and a uniqueness of the solution in the weighted Hölder spaces and obtained sharp estimates.

AMS Classification: Primary 35J25; Secondary 35B45, 35B65.