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Inverse Source and Coefficient Problems for Parabolic Transmission Equations on Multicomponent Domains with Nonlocal Interface Conditions

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Abstract. An inverse problem consists in determining unknown parameters of a system from measurable quantities by means of a mathematical or physical model. Such problems arise in many areas of science and engineering and are often described by differential or integral equations.

When the coefficients, the right-hand side, and the initial and boundary conditions are prescribed, the corresponding problem is called a direct (or forward) problem. Direct problems of this type have been studied in several joint papers with B. S. Jovanović.

We present analytical and numerical results obtained over the last five years for one- and two-dimensional inverse parabolic transmission problems on multicomponent domains with nonlocal interface conditions. Two classes of inverse problems are considered: those in which the unknowns are source terms (right-hand sides), and those in which the unknowns are coefficients or boundary conditions. The additional information used to determine these unknowns includes pointwise or line observations, integral overdetermination, and final-time overdetermination.

Keywords: Inverse problems; parabolic transmission problems; multicomponent domains; nonlocal interface conditions; source identification; coefficient identification.