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ANALYSIS, OPTIMAL CONTROL, AND SIMULATION OF CONDUCTIVE-RADIATIVE HEAT TRANSFER*

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Abstract

This article surveys recent results regarding the existence of weak solutions to quasilinear partial differential equations (PDE) coupled nonlocally by the integral operator of the radiosity equation, modeling conductive-radiative heat transfer. Both the stationary and the transient case are considered. For the stationary case, an optimal control problem with control constraints is presented with first-order necessary optimality conditions, where recent results on the solution theory of the linearized state equation allow to close a previous gap. A finite volume scheme for the discretization of the stationary system is described and, based on this scheme, a numerical computation of the temperature field (solution of the state equation) is shown as well as the numerical solution to a realistic control problem in the context of industrial applications in crystal growth.

MSC: 49K20, 35J60, 35D30, 35K05, 35K55, 45P05, 49J20, 65C20, 80M15, 80M50.

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