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<<A variational inequality approach to free boundary problems with applications in mould filling
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This monograph is devoted to the study of an evolutionary variational inequality approach to a degenerate moving free boundary problem. The inequality approach of obstacle type results from the application of an integral transformation. It takes an intermediate position between elliptic and parabolic inequalities and comprises an elliptic differential operator, a memory term and time-dependent convex constraint sets. The study of such inequality problems is motivated by applications to injection and compression moulding, to electro-chemical machining and other quasi-stationary Stefan type problems.   The mathematical analysis of the problem covers existence, uniqueness, regularity and time evolution of the solution. This is carried out in the framework of the variational inequality theory. The numerical solution in two and three space dimensions is discussed using both finite element and finite volume approximations. Finally, a description of injection and compression moulding is presented in terms of different mathematical models, a generalized Hele-Shaw flow, a distance concept and Navier-Stokes flow.   This volume is primarily addressed to applied mathematicians working in the field of nonlinear partial differential equations and their applications, especially those concerned with numerical aspects. However, the book will also be useful for scientists from the application areas, in particular, applied scientists from engineering and physics.

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