Numerical Simulation of Non-Newtonian Flow (Rheology Series)

M.J. Crochet, A.R. Davies, K. Walters

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Numerical Simulation of Non-Newtonian Flow (Rheology Series) M.J. Crochet, A.R. Davies, K. Walters Numerical Simulation of Non-Newtonian Flow focuses on the numerical simulation of non-Newtonian flow using finite difference and finite element techniques. Topics range from the basic equations governing non-Newtonian fluid mechanics to flow classification and finite element calculation of flow (generalized Newtonian flow and viscoelastic flow). An overview of finite difference and finite element methods is also presented.

Comprised of 11 chapters, this volume begins with an introduction to non-Newtonian mechanics, paying particular attention to the rheometrical properties of non-Newtonian fluids as well as non-Newtonian flow in complex geometries. The role of non-Newtonian fluid mechanics is also considered. The discussion then turns to the basic equations governing non-Newtonian fluid mechanics, including Navier Stokes equations and rheological equations of state. The next chapter describes a flow classification in which the various flow problems are grouped under five main headings: flows dominated by shear viscosity, slow flows (slightly elastic liquids), small deformation flows, nearly-viscometric flows, and long-range memory effects in complex flows. The remainder of the book is devoted to numerical analysis of non-Newtonian fluids using finite difference and finite element techniques.

This monograph will be of interest to students and practitioners of physics and mathematics.

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