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2. Record Nr. UNINA9911020370603321

Autore	Nassehi Vahid
Titolo	Practical aspects of finite element modelling of polymer processing
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Soggetti	Polymers - Mathematical models Chemical processes - Mathematical models Finite element method
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Nota di bibliografia	Includes bibliographical references and indexes.
Nota di contenuto	1. The Basic Equations of Non-Newtonian Fluid Mechanics. -- -- 1.1 Governing Equations of Non-Newtonian Fluid Mechanics -- -- 1.2 Classification of Inelastic Time-Independent Fluids -- -- 1.3 Inelatic Time-Dependent Fluids -- -- 1.4 Viscoelastic Fluids -- -- 2. Weighted Residual Finite Element Methods - -- An Outline. -- -- 2.1 Finite Element Approximation -- -- 2.2 Numerical Solutions of Differential Equations by the Weighted Residual Method -- -- 3. Finite Element Modelling of Polymeric Flow Processes. -- -- 3.1 Solution of the Equations of Continuity and Motion -- -- 3.2 Modelling of Viscoelastic Flow -- -- 3.3 Solution of the Energy Equation -- -- 3.4 Imposition of Boundary Conditions in Polymeric Processing Models -- -- 3.5 Free Surface and Moving Boundary Problems -- -- 4. Working Equations of the Finite Element Schemes. -- -- 4.1 Modelling of Steady State Stokes Flow of a Generalized Newtonian Fluid -- -- 4.2 Variations of Viscosity -- -- 4.3 Modelling of Steady State Viscometric Flow - -- Working Equations of the Continuous Penalty Scheme in Cartesian Coordinate Systems -- -- 4.4 Modelling of Thermal Energy Balance -- -- 4.5 Modelling of Transient Stokes Flow of Generalized Newtonian and Non-Newtonian Fluids -- -- 5. Rational

Approximations and Illustrative Examples. -- -- 5.1 Models based on Simplified Domain Geometry -- -- 5.2 Models based on Simplified Governing Equations -- -- 5.3 Models representing Selected Segments of a Large Domain -- -- 5.4 Models based on Decoupled Flow Equations - -- Simulation of the Flow inside a Cone-and-Plate Rheometer -- -- 5.5 Models based on Thin Layer Approximation -- -- 5.6 Stiffness Analysis of Solid Polymeric Materials -- -- 6. Finite Element Software - -- Main Components. -- -- 6.1 General Consideration to Finite Element Mesh Generation -- -- 6.2 Main Components of Finite Element Processor Programs -- -- 6.3 Numerical Solution of the Global Systems of Algebraic Equations -- -- 6.4 Solutions Algorithms based on the Gaussian Elimination Method -- -- 6.5 Computation Errors -- -- 7. Computer Simulations - -- Finite Element Program. -- -- 7.1 Program Structure and Algorithm -- -- 7.2 Program Specifications -- -- 7.3 Input Data File -- -- 7.4 Extension of PPVN.f to Axisymmetric Problems -- -- 7.5 Circulatory Flow in a Rectangular Domain -- -- 7.6 Source Code of PPVN.f -- -- References -- -- 8. Appendix - -- Summary of Vector and Tensor Analysis. -- -- 8.1 Vector Algebra -- -- 8.2 Some Vector Calculua Relations -- -- 8.3 Tensor Algebra -- -- 8.4 Some Tensor Calculus Relations -- -- Author Index. -- -- Subject Index.

Sommario/riassunto

Authored by a respected scientist with a growing international reputation this is a self-contained text that can be used by the beginners and the experts alike, to study the basic aspects of finite element modelling. It provides a sound physical understanding of the basis on which mathematical models of polymer processes are built.* Written from a chemical engineering rather then a mathematical perspective it enables the reader to get up to speed in a relatively short time* Provides the 'parts and tools' required to assemble finite element models, applicable to situations that arise under realistic conditions* Discusses and compares specific finite element schemes that provide the most reliable and robust numerical solution procedures for polymer processing models* Practical examples give a wide ranging view of the application of finite element analysis to industrial problems* Describes non-Newtonian fluid mechanics equations in a self-contained, concise and clear manner* Includes clear and simple readily compiled code to model simple problems that can be extended to solve more complex polymer processing problemsThis book makes the subject accessible to a wide audience ranging from senior under-graduate to post-graduate engineering students, as well as, researchers and practising engineers involved in polymer industry.