The present monograph is intended as an introduction into a field which certainly did not receive proper attention in the past. It is one of the aims of this book to verify this supposition. The author hopes to show that the technique of the measurement of flow birefringence can fulfill an important complementary task in polymer melt rheology. From this point it is expected that the present monograph will attract the attention of polymer scientists in general, and of rheologists and process engineers in particular. Certainly, the fourth chapter will appeal to the latter group. As a teacher in polymer science and technology the author wants to address also the group of the graduate students. In fact, the standard knowledge acquired during usual university studies in chemistry, physics or engineering does not enable a quick start of research activities in the field of polymer melt rheology. Certainly, in this typically interdisciplinary field everyone can lay emphasis on matters which are familiar to him because of his preceding education. Significant research activities, however, can only be generated on the basis of a more universal knowledge. In the absence of this knowledge beginners have to rely upon the guidance of their supervisors for an unduly long period. Otherwise they take the risk of losing too much of their costly time. This holds in particular for the experimentalists who cannot be dispensed from being familiar with the necessary theoretical background.

Presents rheological data on a number of polymers, making use of the master curve approach to determine unified curves for each generic type of polymer. The text offers a step-by-step procedure for developing a spreadsheet computer program to obtain accurate thermoplastic rheograms at any temperature without using sophisticated rheometers. It inclu

The continually growing plastics market consists of more than 250 million tons of product annually, making the recurring problem of polymer melt fracture an acute issue in the extrusion of these materials. Presenting a pictorial library of the different forms of melt fracture and real industrial extrusion melt fracture phenomena, Polymer Melt Fracture provides pragmatic identification and industrial extrusion defect remediation strategies based on detailed experimental and theoretical findings from the last 50 years. Distinct microscopic photos Each chapter in this comprehensive volume covers a different aspect of the science and technology relating to polymer melt fracture. The book begins with a collection of optical and scanning electron microscopy pictures. These photos show distorted capillary die extrudates for a number of commercially available polymers. The authors present a brief introduction to the basic science and technology of polymers. They explain what polymers are, how they are made, and how they can be characterized. They also discuss polymer rheology, review the principles of continuum mechanics, and define linear viscoelastic material functions. Techniques for observing and measuring fracture Next, the book explains how polymer melt fracture is actually experienced in the polymer processing industry. It explains the various ways polymer melt fracture may appear during polymer melt processing in different extrusion processes. The authors provide comprehensive reviews of the polymer melt fracture literature, with chapters on experimental findings and the techniques used to observe and measure polymer melt fracture, and the influence of polymer architecture and polymer processing conditions on the onset and types of polymer melt fracture. Posing a hypothesis about the phenomenon, the book presents the current understanding of polymer melt fracture. Mathematical equations Recognizing the importance of models for simulations that may indicate potential solutions, the book discusses aspects of non-linear constitutive equations and microscopic theory and develops a macroscopic model, explaining the capabilities and limitations of this approach. The book presents an overview of pragmatic tools and methods that have been used to prevent the appearance of polymer melt fracture and explains how to use them to suppress defects.

Everything flows, so rheology is a universal science. Even if we set aside claims of such width, there can be no doubt of its importance in polymers. It joins with chemistry in the polymerisation step but polymer engineering is supreme in all the succeeding steps. This is the area concerned with the fabrication of the polymer into articles or components, with their design to meet the needs in service, and with the long and short term performance of the article or component. This is a typical area of professional engineering activity, but one as yet without its proper complement of professional engineers. An understanding of polymer rheology is the key to effective design and material plus process selection, to efficient fabrication, and to satisfactory service, yet few engineers make adequate use of what is known and understood in polymer rheology. Its importance in the flow processes of fabrication is obvious. Less obvious, but equally important, are the rheological phenomena which determine the in-service performance. There is a gap between the polymer rheologist and the polymer engineer which is damaging to both parties and which contributes to a less than satisfactory use of polymers in our society. It is important that this gap be filled and this book makes an attempt to do so. It presents an outline of what is known in a concise and logical fashion. It does this starting from first principles and with the minimum use of complex mathematics.

Rheology unites the seemingly unrelated fields of plasticity and non-Newtonian fluids by recognizing that both these types of materials are unable to support a shear stress in static equilibrium. In this sense, a plastic solid is a fluid. Granular rheology refers to the continuum mechanical description of granular materials. In this book, rheology—the study of the deformation and flow of matter—is treated primarily in the context of the stresses generated during the flow of complex materials such as polymers, colloids, foams, and gels. A rapidly growing and industrially important field, it plays a significant role in polymer processing, food processing, coating and printing, and many other manufacturing processes.

Constitutive Equations for Polymer Melts and Solutions presents a description of important constitutive equations for stress and birefringence in polymer melts, as well as in dilute and concentrated solutions of flexible and rigid polymers, and in liquid crystalline materials. The book serves as an introduction and guide to constitutive equations, and to molecular and phenomenological theories of polymer motion and flow. The chapters in the text discuss topics on the flow phenomena commonly associated with viscoelasticity; fundamental elementary models for understanding the rheology of melts, solutions of flexible polymers, and advanced constitutive equations; melts and concentrated solutions of flexible polymer; and the rheological properties of real liquid crystal polymers. Chemical engineers and physicists will find the text very useful.
This book presents the main results obtained by different laboratories involved in the research group Rheology for polymer melt processing which is associated with French universities, schools of engineering, and the CNRS (Centre National de la Recherche Scientifique - France). The group comprises some 15 research laboratories of varied disciplines (chemistry, physics, material sciences, mechanics, mathematics), but with a common challenge viz. to enhance the understanding of the relationships between macromolecular species, their rheology and their processing. Some crucial issues of polymer science have been addressed: correlation of viscoelastic macroscopic bulk property measurements and models, slip at the wall, extrusion defects, correlation between numerical flow simulations and experiments. Features of the book: • The book is unique in that it allows one to grasp the key issues in polymer rheology and processing at once through a series of detailed state-of-the-art contributions, which were previously scattered throughout the literature. • Each paper was reviewed by experts and the book editors and some coordination was established in order to achieve a readable and easy access style. • Papers have been grouped in sections covering successively: Molecular dynamics, Constitutive equations and numerical modelling, Simple and complex flows. • Each paper can be read independently. Since the book is intended as an introduction to the main topics in polymer processing, it will be of interest to graduate students as well as to scientists in academic and industrial laboratories.

Recent advances in polymer science have made it possible to relate quantitatively molecular structure to rheological behavior. At the same time, new methods of synthesis and characterization allow the preparation and structural verification of samples having a range of branched polymeric structures. This book unites this knowledge to enable production of polymers with prescribed processability and end-product properties. Methods of polymer synthesis and characterization are described, starting from fundamentals. The foundations of linear viscoelasticity are introduced, and then the linear behavior of entangled polymers is described in detail. This is followed by a discussion of the molecular modeling of linear behavior. Tube models for both linear and branched polymers are presented. The final two chapters deal with nonlinear rheological behavior and tube models to describe nonlinearity. In this second edition, each chapter has been significantly rewritten to account for recent advances in experimental methods and theoretical modeling. It includes new and updated material on developments in polymer synthesis and characterization, computational algorithms for linear and nonlinear rheology prediction, measurement of nonlinear viscoelasticity, entanglement detection algorithms in molecular dynamics, nonlinear constitutive equations, and instabilities. Contents: - Structure of Polymers - Polymerization Reactions and Processes - Linear Viscoelasticity - Fundamentals - Linear Viscoelasticity - Behavior of Molten Polymers - Tube Models for Linear Polymers - Fundamentals - Tube Models for Linear Polymers - Advanced Topics - Determination of Molecular Weight Distribution Using Rheology - Tube Models for Branched Polymers - Nonlinear Viscoelasticity - Tube Models for Nonlinear Viscoelasticity of Linear and Branched Polymers

This book covers a wide range of topics in polymer rheology. These include: - the basic principles, parameters, systems and applied mathematical models used in rheological studies. The melt flow analysis of different non-newtonian fluids is laminar flow, transition between laminar and turbulent flow and modified Reynolds etc. The effects of different physical and molecular parameters on purely viscous rheological response of polymer melts and solutions. Principles of rheometry and different types of viscometers and on-line rheometers. The static and dynamic viscoelastic response of polymer melts and solutions, linear viscoelasticity, mechanical models and Boltzmann superposition principle. Molecular structure - viscoelasticity relationship and linear and non-linear viscoelasticity. A good number of solved examples and exercises. The book will be of immense help to both undergraduate and postgraduate students, teachers, polymer engineers and practicing rheologists. Content highlights: - Preface # Introduction # Rheological Principles # Melt Flow Analysis # Parameters Influencing the Polymer Rheology # Rheometry # Viscoelastic Behaviour # Viscoelastic Functions: Effect of Various Parameters # Rheology in Polymer and Rubber Processing # References

More than 900 authors from over 35 countries contributed to the 1992 International Congress on Rheology. These proceedings volumes comprise 17 plenary and keynote papers, 250 oral contributions and some 200 poster presentations. All relevant aspects of rheology are covered, e.g., theoretical rheology, molecular theories, fluid mechanics, rheometry, experimental methods, foams, polymer solutions, polymer melts, rubber, solids, composites, bioreheology, industrial rheology, polymer processing, food rheology and electro rheology, reflecting the development of rheology into a broad, multidisciplinary field of recognized academic and industrial relevance.

This is the second edition of Melt Rheology and its Role in Plastics Processing, although the title has changed to reflect its broadened scope. Advances in the recent years in rheometer technology and polymer science have greatly enhanced the usefulness of rheology in the plastics industry. It is now possible to design polymers with specific molecular structures and to predict the flow properties of melts having those structures. In addition, rheological properties now provide more precise information about molecular structure. This book provides all the information that is needed for the intelligent application of rheology in the development of new polymers, the determination of molecular structure and the correlation of processability with laboratory test data. Theory and equations are limited to what is essential for the use of rheology in the characterization of polymers, the development of new plastics materials and the prediction of plastics processing behavior. The emphasis is on information that will be of direct use to practitioners. Extensive references are provided for those wishing to pursue certain issues in greater depth. While the primary audience is applied polymer scientists and plastics engineers, the book will also be of use to postgraduate students in polymer science and engineering and as a text for a graduate course.

My heart sank when I was approached by Dr. Hastings and by Professor Briggs (Senior Editor of Materia) Science and Technology and Series Editor of Polymer Science and Technology Series at Chapman & Hall, respectively) to edit a book with the provisional title Handbook of Polypropylene. My reluctance was due to the fact that my former book [1] along with that of Moore [2], issued in the meantime, seemed to cover the information demand on polypolymer and related systems. Encouraged, however, by some colleagues (the new generation of scientists and engineers needs a good reference book with easy information retrieval, and the development with metalocene catalysts deserves a new update). I started on this venture. Having some experience with polypolymer systems and being aware of the current literature, it was easy to settle the titles for the book chapters and also to select and approach the most suitable potential contributors. Fortunately, many of my first-choice authors accepted the invitation to contribute. Like all editors of multi-author volumes, I recognize that obtaining contributors follows an S-type curve of asymptotic saturation when the number of willing contributors is plotted as a function of time. The saturation point is, however, never reached and as a consequence, Dear Reader, you will also find some topics of some relevance which are not explicitly treated in this book (but, believe me, I have considered them).

Most of the shaping in the manufacture of polymeric objects is carried out in the melt state, as it is a substantial part of the physical property
development. Melt processing involves an interplay between fluid mechanics and heat transfer in rheologically complex liquids, and taken as a whole it is a nice example of the importance of coupled transport processes. This book is on the underlying foundations of polymer melt processing, which can be derived from relatively straightforward ideas in fluid mechanics and heat transfer; the level is that of an advanced undergraduate or beginning graduate course, and the material can serve as the text for a course in polymer processing or for a second course in transport processes.

Rheology is, by common consent, a difficult subject and some of the theoretical components are often viewed as being of prohibitive complexity by scientists without a strong mathematical background. There are also the difficulties inherent in any multidisciplinary science like rheology for those with a specific training. Therefore, newcomers to the field are sometimes discouraged, and for them the existing texts on the subject - some of which are outstanding - are of limited assistance because of their depth of detail and highly mathematical nature. This book introduces the subject of rheology in terms understandable to non-experts and describes the application of rheological principles to many industrial products and processes. It provides a simple but authoritative guide which shows clearly how mathematics, physics and chemistry have contributed to the development of rheology. The generic features of all liquid-like materials are summarised, i.e. viscosity, linear viscoelasticity, normal stresses and extensional viscosity. Particular systems are then discussed, i.e. polymeric liquids and suspensions. The final chapter gives an outline of the theoretical advances which have been made. Consistent notation and nomenclature have been maintained throughout the book, and the key textbooks and publications which will enable the reader to follow up particular topics are listed.

This is the second edition of Melt Rheology and its Role in Plastics Processing, although the title has changed to reflect its broadened scope. Advances in the recent years in rheometer technology and polymer science have greatly enhanced the usefulness of rheology in the plastics industry. It is now possible to design polymers having specific molecular structures and to predict the flow properties of melts having those structures. In addition, rheological properties now provide more precise information about molecular structure. This book provides all the information that is needed for the intelligent application of rheology in the development of new polymers, the determination of molecular structure and the correlation of processability with laboratory test data. Theory and equations are limited to what is essential for the use of rheology in the characterization of polymers, the development of new plastics materials and the prediction of plastics processing behavior. The emphasis is on information that will be of direct use to practitioners. Extensive references are provided for those wishing to pursue certain issues in greater depth. While the primary audience is applied polymer scientists and plastics engineers, the book will also be of use to postgraduate students in polymer science and engineering and as a text for a graduate course.

Rheology is a component of Encyclopedia of Chemical Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty Encyclopedias. Rheology is the study of the flow of matter. It is classified as a physics discipline and focuses on substances that do not maintain a constant viscosity or state of flow. That can involve liquids, soft solids and solids that are under conditions that cause them to flow. It applies to substances which have a complex molecular structure, such as muds, sludges, suspensions, polymers and other glassy materials, as well as many foods and additives, bodily fluids and other biological materials. The theme on Rheology focuses on five main areas, namely, basic concepts of rheology; rheometry; rheological materials, rheological processes and theoretical rheology. Of course, many of the chapters contain material from more than one general area. Rheology is an interdisciplinary subject which embraces many aspects of mathematics, physics, chemistry, engineering and biology. These two volumes are aimed at the following five major target audiences: University and College students, Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.

A new analysis of polymer and composite rheology. This second edition covers flow properties of thermoplastic and thermoset polymers, and general principles and applications of all phases of polymer rheology, with new chapters on the rheology of particulate and fibre composites. It also includes new and expanded detail on polymer blends and emulsions, foams, reactions systems, and flow through porous media as well as composite processing operations.

This text introduces the subject of rheology in terms understandable to non-experts and describes the application of rheological principles to many industrial products and processes.

Rheology is the science that studies the behavior of the flow of matter in a liquid state or soft solids under the application of stress or deformation to obtain a response to an applied force. In polymers, rheology is an important tool to understand behavior under processing conditions and to design equipment. A nother application for rheology in the polymer field is to understand structure-property relationships by means of molecular weight, molecular weight distribution, rheochemistry, morphology, melt degradation, and performance under processing. This book covers the essential criteria for selecting the best test types for various applications and new developments, for accurately interpreting results, and for determining other areas where rheology and rheological phenomena may be useful in your work.

This book describes the properties of single polymer molecules and polymeric materials and the methods how to characterize them. Molecular masses, molar mass distributions and branching structure are discussed in detail. These properties are decisive for a deeper understanding of structure/properties relationships of polymeric materials. This book therefore describes and discusses them in detail. The mechanical behavior as a function of time and temperature is a key subject of the book. The authors present it on the basis of many original results they have obtained in their long research careers. They present the temperature dependence of mechanical properties of various polymeric materials in a wide temperature range: from cryogenic temperatures to the melt. Besides an extensive data collection on the transitions of various different polymeric materials, they also carefully present the physical explanations of the observed phenomena. Glass transition and melting temperatures are discussed, particularly, with their relevance for applications. A comprehensive part of the book deals with properties of polymers in the molten state and their decisive influence on the processing of the materials. The book presents and discusses viscous and elastic properties in detail as a function of molar mass, polydispersity, and branching. This book addresses students of polymer and materials science, as well as other natural sciences. Besides this educational value, it will also serve as a valuable monograph for everyone dealing with polymers and polymeric materials, from research, over development, to applications.

Experts in rheology and polymer processing present up-to-date, fundamental and applied information on the rheological properties of polymers, in particular those relevant to processing, contributing to the physical understanding and the mathematical modelling of polymer processing sequences. Basic concepts of non-Newtonian fluid mechanics, micro-rheological modelling and constitutive modelling are reviewed, and rheological measurements are described. Topics with practical relevance are debated, such as linear viscoelasticity, converging and diverging flows, and the rheology of multiphase systems. Approximation methods are discussed for the computer modelling of polymer melt flow. Subsequently, polymer processing technologies are studied from both simulation and engineering perspectives. Mixing, crystallization and reactive processing aspects are also included. A audience: An integrated and complete view of polymer processing and rheology, important to institutions and individuals engaged in the characterisation, testing, compounding, modification and processing of polymeric materials. Can also support academic polymer processing engineering programs.

The conference was about novel trends in theoretical and experimental rheology especially for macromolecular substances - polymers. Specific attention...
has been paid to introduction and/or utilization of novel rheological tools/techniques, constitutive equations for polymer melts, non-Newtonian flow modeling, flow behavior understanding of polymers, nanocomposites, blends and hydrogels, polymer melt flow stability in extrusion and coextrusion, electrorheology, magnetorheology, electrospinning and polymeric nanofibers. The main aim of the conference was to demonstrate how rheology can be applied to understanding polymers and their processing.

This review encompasses fundamental principles and rheological equations of state, polymer melt rheology (shear and extensional flow, viscoelasticity, die swell and melt fracture) and rheological c094 techniques. It describes the main plastics processing techniques, and explains the influence of polymer melt rheology upon their operation. An additional indexed section containing several hundred abstracts from the Rapra Polymer Library database provides useful references for further reading.

An introduction to the rheology of polymers, with simiplesh Designed for practicing scientists and engineers interested inpolymer rheology science, education, consulting, or research and development. Introduction to Polymer Rheology is a comprehensive yet accessible guide to the study of the deformation and flow of matter under applied stress. Often considered a complicated topic for beginners, the book makes grasping the fundamentals of polymer rheology easy by presenting informative and simple examples of the use of complex mathematics. By doing so, this introductory overview provides readers with easy access to the key concepts underlying the flow behavior of polymer melts, solutions, and suspensions. Incorporating sample problems that are worked through and explained on the page, as well as numerous practice problems to gauge learning comprehension, the book prepares new students and practitioners for moving on to more advanced concepts. Comprising twelve chapters, the book covers stress, velocity, and deformation of the relationship between stress and rate of deformation (Newtonian fluid), generalized Newtonian fluids, normal stresses and elastic behavior, experimental methods, small and large strain, the molecular origins of rheological behavior, elementary polymer processing concepts, quality control in rheology, and the flow of modified polymers and those with supramolecular structure. The essential reference for accurately interpreting polymereology data. Introduction to Polymer Rheology provides readers with an understandable understanding of the key issues and modern approaches to solving problems in the field. An instructor's guide with answers to select problems in the text, 60 new problems with full solutions, hints for effective representation of the material in the text, and an errata listing is available for professors using the book as a course textbook.

Rheology: Concepts, Methods, and Applications, Third Edition provides a thorough historical and theoretical grounding in the field, and introduces rheology as the method of solving many practical problems in materials science and engineering. The book is practical and relevant for industry, but is also consistent with rheology courses in academia, making it relevant to both academics and accomplished rheologists in industry. The first four chapters discuss various aspects of theoretical rheology and, through examples from numerous studies, show how particular theories, models, or equations can be used in solving different problems. The shared experience and insight contained in these chapters assists practitioners carrying out rheological studies in generating relevant data. This helps to avert costly errors in analysis which are common when data are generated under the wrong conditions, or are incorrectly used. The fifth chapter covers methods of measurement and treatment of raw data—eight groups of methods are discussed in this chapter, providing the reader with many options for experimentation, along with guidance on how to use them properly. The final chapter demonstrates how to use rheological methods for different groups of products and manufacturing methods. The usefulness of chemorheological (rheokinematic) measurements is also emphasized. The chapter has a particular emphasis on real-world applications of rheology, and gives practical guidance to enable material scientists to gather data and solve problems using these methods. This book is a systematic presentation of the subject of rheology—written by two of the foremost researchers in the field—showing the subject as an interrelated system of concepts, principal phenomena, experimental methods, and directions of their application. It also links with other branches of theoretical and applied sciences. Provides substantial experience and insight to assist rheologists working in a range of industries to generate relevant data, avoiding costly errors in analysis. Includes eight groups of measurement methods, providing the reader with options so they can choose the most effective for their situation. Offers thorough coverage of different applications of rheology, demonstrating how to use rheological methods for different products—from polymeric materials to food products, biological fluids, and electro and magnetic materials.

This book explores the ways in which melt flow behaviour can be exploited by the plastics engineer and technician for increased efficiency of processing operation, control of end product properties and selection and development of polymers for specific purposes. (revised with minor corrections 1994)

In addition to structure formation in crystallizing polymers and semicrystalline polymers, this second edition completes the topic of transport phenomena. It also reviews solidification by crystallization during cooling and under flow or pressure, which all play an enormous role in polymer melt processing. Generally, there is an intensive interaction between three transport phenomena: heat transfer, momentum transfer (flow, rheology) and (flow induced) crystallization. The strong interaction between the three transport phenomena is a major challenge when it comes to experimentation, and advances in this area are detailed in the book, guiding further development of sound modeling. This book enables readers to follow an advanced course in polymer processing. It is a valuable reference for polymer chemists, applied physicists, rheologists, plastics engineers, mold makers and materials scientists.

This volume represents a continuation of the Polymer Science and Technology series edited by Dr. D. M. Brewis and Professor D. Briggs. The theme of the series is the production of a number of stand alone volumes on various areas of polymer science and technology. Each volume contains short articles by a variety of expert contributors outlining a particular topic and these articles are extensively cross referenced. References to related topics included in the volume are indicated by bold text in the articles, the bold text being the title of the relevant article. At the end of each article there is a list of bibliographic references where interested readers can obtain further detailed information on the subject of the article. This volume was produced at the invitation of Derek Brewis who asked me to edit a text which concentrated on the mechanical properties of polymers. There are already many excellent books on the mechanical properties of polymers, and a somewhat lesser number of volumes dealing with methods of carrying out mechanical tests on polymers. Some of these books are listed in Appendix 1. In this volume I have attempted to cover basic mechanical properties and test methods as well as the theory of polymer mechanical deformation and hope that the reader will find the approach useful.

Explore polymer rheology from an industrial standpoint. Presenting state-of-the-art polymer rheology as observed by well-recognized authors, Applied Polymer Rheology: Polymeric Fluids with Industrial Applications is designed to help readers understand the relationship between molecular structure and the flow behavior of polymers. In particular, it focuses on polymeric systems that elicit special attention from industry. Providing a comprehensive overview of the rheological characteristics of polymeric fluids, the book bridges the gap between theory and practice/application, enabling readers to see the connection between molecular structure and the behavior of the polymers studied. Beginning with a discussion of the properties, processability, and processing aids of specific polymers, later chapters examine filled polymers and composites, and the theoretical framework upon which their analysis is based. Various systems containing microstructure are presented subsequently, with the final chapter introducing paste extrusion of polytetrafluoroethylene paste. An invaluable reference guide that covers the literature and vast array of technical approaches to polymer rheology, Applied Polymer Rheology's coverage of polymeric fluids of interest to industry make it an essential resource for plastics, polymer, and chemical engineers, materials scientists, polymer chemists, and polymer physicists to use when interpreting findings and planning experiments.
Structure formation in crystallizing polymers, as occurring during processing, has not been treated so far in a coherent form. This fact explains why this monograph is written as the first book devoted to this subject. A quarter of a century ago the underdevelopment of this subject was obvious. Trial and error dominated. In fact, other opposite subjects as polymer melt rheology or heat transfer, had reached high levels. A great number of books has been devoted to them. Molding of amorphous polymers and the solidification of these polymers by vitrification can nowadays be simulated numerically with a high degree of accuracy. In the solidified sample even residual stresses and corresponding birefringence effects can accurately be calculated. However, semicrystalline polymers, which form the majority of industrial polymers, have been excluded from these considerations for good reasons. In fact, great uncertainties existed about the formation of quality determining crystalline structures. In particular, polyolefins suffered from this shortcoming. In 1983 this fact instigated the polymer research group at the Johannes Kepler University in Linz to start with pertinent activities. The urgency of this kind of studies becomes evident, if advantages and hitches of these polymers are considered. 1. Versatility of processing: Injection molding into a great variety of shapes and sizes, from thin walled beakers to garden chairs, not to forget pipe and profile extrusion, cable coating, fiber spinning, film blowing. 2. Product qualities: Ductility, low density, good electric insulation, corrosion resistance, surface quality.

Polymeric materials have been replacing other conventional materials like metals, glass and wood in a number of applications. The use of various types of fillers incorporated into the polymer has become quite common as a means of reducing cost and to impart certain desirable mechanical, thermal, electrical and magnetic properties to the polymers. Due to the energy crisis and high prices of petrochemicals, there has been a greater demand to use more and more fillers to cheapen the polymeric materials while maintaining and/or improving their properties. The advantages that filled polymer systems have to offer are normally offset to some extent by the increased complexity in the rheological behavior that is introduced by the inclusion of the fillers. Usually when the use of fillers is considered, a compromise has to be made between the improved mechanical properties in the solid state, the increased difficulty in melt processing, the problem of achieving uniform dispersion of the filler in the polymer matrix and the economics of the process due to the added step of compounding. It has been recognized that addition of filler to the polymer brings a change in processing behavior. The presence of the filler increases the melt viscosity leading to increases in the pressure drop across the die but gives rise to less die swell due to decreased melt elasticity.

This book is designed to fulfill a dual role. On the one hand it provides a description of the rheological behavior of molten polymers. On the other, it presents the role of rheology in melt processing operations. The account of rheology emphasizes the underlying principles and presents results, but not detailed derivations of equations. The processing operations are described qualitatively, and wherever possible the role of rheology is discussed quantitatively. Little emphasis is given to non-rheological aspects of processes, for example, the design of machinery. The audience for which the book is intended is also dual in that it includes scientists and engineers whose work in the nature. plastics industry requires some knowledge of aspects of rheology. Examples are the polymer synthetic chemist who is concerned with how a change in molecular weight will affect the melt viscosity and the extrusion engineer who needs to know the effects of a change in molecular weight distribution that might result from thermal degradation. The audience also includes post-graduate students in polymer science and engineering who wish to acquire a more extensive background in rheology and perhaps become specialists in this area. Especially for the latter audience, references are given to more detailed accounts of specialized topics, such as constitutive relations and process simulations. Thus, the book could serve as a textbook for a graduate level course in polymer rheology, and it has been used for this purpose.