

POLIMERY

CZASOPISMO POŚWIĘCONE CHEMII, TECHNOLOGII I PRZETWÓRSTWU POLIMERÓW

Od Redakcji / Editorial Note

Niniejszy zeszyt „Polimerów” jest poświęcony zagadnieniom związanym z reologią polimerów. Zespół Redakcyjny wyraża serdeczne podziękowanie prof. dr. hab. inż. Tomaszowi Sterzyńskiemu za inicjatywę wydania tego zeszytu oraz za cenną pomoc merytoryczną w jego przygotowaniu.

This issue of „Polimery” journal is devoted to problems related to the rheology of the polymers. The editorial team expresses its sincere gratitude to Prof. Dr. Tomasz Sterzyński for the initiative to publish this issue and his valuable and substantial assistance in editorial activities.

Recent advances in modeling of polymer melt rheology

Manfred H. Wagner^{1a, *}, Víctor H. Rolón-Garrido²⁾

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Abstract: To understand the link between polymerisation of a specific monomer and the product properties, it is extremely helpful to perform a rheological characterization under conditions as close as possible to those occurring in industry. A reliable rheological constitutive equation with as less free parameters as possible is also extremely necessary to reproduce accurately the experimental results obtained for a broad variety of polymer samples at different types of deformations. This allows the establishment of quantitative structure-property relations and permits simulations for specific polymer processes by numerical methods. It is the main objective of the present work to stress the role of rheology in melt processing in the framework of the rheotens experiment, and to give an overview about recent advances in modeling of polymer melt rheology. We discuss grandmastercurves obtained from the rheotens curves, as well as the rupture stress of polymer melts. In the context of rheological constitutive equations, we remind of the limitations of the rubber like-liquid and Doi-Edwards models. The introduction of the interchain tube pressure concept into the molecular stress function (MSF) model is explained. This approach permits to describe quantitatively the transient and steady-state uniaxial viscosities as well as the shear flow response of different nearly monodisperse linear polymers, without any free parameter.

Keywords: rheotens, rheology, constitutive equation, Doi-Edwards tube model, MSF model.

Postęp w modelowaniu reologii stopionych polimerów

Streszczenie: W ocenie zależności między polimeryzacją danego monomeru a właściwościami wytworzonego polimeru, korzystne jest wykorzystanie charakterystyki reologicznej w warunkach możliwie

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Rheology For Polymer Melt Processing Advances In The Biosciences

John M Dealy, K.F. Wissbrun



Rheology For Polymer Melt Processing Advances In The Biosciences:

Rheology for Polymer Melt Processing J.-M. Piau, J.-F. Agassant, 1996-10-10 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 Industrial Polymers Mr. Rohit

Manglik, 2024-01-15 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels **Melt**

Rheology and its Applications in the Plastics Industry John M Dealy, Jian Wang, 2013-05-14 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 *Plastics Technology*

Handbook, Fourth Edition Manas Chanda, Salil K. Roy, 2006-12-19 Because the field of plastics is one of the fastest changing areas today the need arises to offer relevant comprehensive material on polymers An established source of information on modern plastics the *Plastics Technology Handbook* continues to provide up to date coverage on the properties processing methods and applications of polymers Retaining the easy to follow structure of the previous editions this fourth edition includes new topics of interest that reflect recent developments and lead to better insights into the molecular behavior of polymers New to the Fourth Edition Advances in supramolecular polymerization flame retardancy polymer based nanomedicines and drug delivery The new concept of oxo biodegradable polymers Broadened discussion on plastic foams and foam extrusion processes More information on the processing and applications of industrial polymers including the emerging field of nanoblends Developments in polymer synthesis and applications such as polymeric sensors hydrogels and smart polymers hyperbranched polymers shape memory polymers polymeric optical fibers scavenger resins polymer nanocomposites polymerization filled composites and wood polymer composites A state of the art account of the various available methods for plastics recycling Advances in the use of polymers in packaging construction the automotive and aerospace industries agriculture electronics and electrical technology biomedical applications corrosion prevention and sports and marine applications *Plastics Technology Handbook Fourth Edition* thoroughly covers traditional industrial polymers and their processing methods as well as contemporary polymeric materials recent trends and the latest applications

Industrial Polymers, Specialty Polymers, and Their Applications Manas Chanda, Salil K. Roy, 2008-07-18 Derived from the fourth edition of the well known *Plastics Technology Handbook* *Industrial Polymers Specialty Polymers and Their Applications* covers a wide range of general and special types of polymers Polymer Melt Rheology F N

Cogswell, 1981-01-01 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 reissued with minor corrections 1994 **Melt Rheology and Its Role in Plastics**

Processing John M Dealy, K.F. Wissbrun, 1990-07-31 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 emphasises 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 nature It includes scientists and engineers whose work in the 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 **Melt Rheology and Its Role in**

Plastics Processing K. Wissbrun,2014-09-01 **Melt Rheology and Its Role in Plastics Processing** K.

Wissbrun,2014-04-09 This book is designed to fulfill a dual role On the one hand it provides a description of the rheological behavior of molten poly mers On the other it presents the role of rheology in melt processing operations The account of rheology emphasises the underlying principles and presents results but not detailed deriva tions of equations The processing operations are described qualita tively 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 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 degra dation 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 Rheology and Its Role in Plastics Processing P. Prentice,1995 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

Polymer Rheology and Processing A.A. Collyer,L.A. Utracki,1990-10-31 *Thermoplastic Melt Rheology and Processing* Aroon Shenoy,1996-08-23 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 tempertature without using sophisticated rheometres It inclu **Rheological Fundamentals of Polymer Processing** J.A. Covas,J.F. Agassant,A.C. Diogo,J. Vlachopoulos,K. Walters,1995-10-31 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 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

Rheology and Processing of Polymers Khalid Lamnawar, Abderrahim Maazouz, 2022-10-04 This book covers the latest developments in the field of rheology and polymer processing highlighting cutting edge research focusing on the processing of advanced polymers and their composites It demonstrates that the field of rheology and polymer processing is still gaining increased attention Presented within are cutting edge research results and the latest developments in the field of polymer science and engineering innovations in the processing and characterization of biopolymers and polymer based products polymer physics composites modeling and simulations and rheology

Rheology in Polymer Processing Chang Dae Han, 1976 *Elastic Behavior of Polymer Melts - Rheology and Processing* Helmut Münstedt, 2019

Rheology Applied in Polymer Processing B.R. Gupta, 2022-11-17 This book covers a wide range of topics in polymer rheology These are Basic Principles parameters systems and applied mathematical models used in the rheological studies Melt flow analysis of different non Newtonian fluids in laminar flow transition between laminar and turbulent flow and modified Reynolds number 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 the polymer melts and solutions viscoelasticity mechanical models and Boltzmann superposition principle Molecular structure viscoelasticity relationship and linear and non linear viscoelasticity Effects of different processes materials parameters like temperature fillers micro and nano fillers and molecular parameters like MW MWD The role of rheology in polymer processing in different equipment Modified power law constants and two range power law constants for a large number of polymers rheology software program in Java comparison of different polymer rheological models using the rheology software and answers to the problems The book will be very useful to both undergraduate and postgraduate students as well as teachers and practicing rheologists

Rheology in Polymer Processing Krzysztof Wilczynski, 2020-12-07 Rheology in Polymer Processing introduces the fundamentals of rheology and rheometry as the basis for modeling and computer aided design in plastics processing The logically structured content enables the reader to intelligently use the tools of computer aided design and modeling of plastics processing with correct interpretation of the results The book presents difficult and complex issues of rheology and modeling in an accessible way with particular emphasis on the practical engineering aspects

The software described in the book allows modeling all the important problems of plastics processing. Particular attention is paid to the extrusion process which is fundamentally important as a processing technology in mass manufacture of plastic parts and the basis of compounding processes blending filling granulation and reinforcement. This book is aimed equally at engineers, researchers and scientists as well as intermediate students for whom it will serve as an ideal course book.

Polymer Melt Rheology and Flow Birefringence Hermann Janeschitz-Kriegl, 2012-12-06. 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 fulfil 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.

Rheology of Filled Polymer Systems A.V. Shenoy, 2013-03-09. 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.

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