



# Flowinduced Crystallization Of Polymers

**R. Kirk Guy**



## **Flow-induced Crystallization Of Polymers:**

**Flow-Induced Crystallization of Polymers** Gaetano Guerra, 2002-12-20 In polymer processing the molecular orientation induced by flow has a significant effect on the crystallization kinetics and final morphology of the polymer produced. The impact on processing operations and object properties is extremely important and recently scientific and technological researchers have begun to quantify these effects. The international conference Flow Induced Crystallization of Polymers held in October 2001 in Salerno Italy was timely and well attended. An interdisciplinary approach was taken and presentations were made on topics ranging from real time measurement through modelling to final morphology and properties of polymers. Invited and other selected contributions from the conference are collected here in this volume of Macromolecular Symposia. *Flow induced crystallization of polymers. Impact to processing and manufacture properties* Giuseppe Titomanlio, Gaetano Guerra, 2001. Flow-Induced Crystallization in Polymer Systems Robert L. Miller, 1977

Flow Induced Crystallization of Polymers Hans Zuidema, 2000. **Flow-induced Crystallization in Polymer Systems** Robert L. Miller, 1979-01-01. *Flow Induced Crystallization of Polymers* Hans Zuidema, 2000. **A Study of Flow Induced Crystallization in Two-phase Polymer Melts** R. Kirk Guy, 1992. The effects of shearing and elongational flows on flow induced crystallization in polymer melts were investigated for the two phase system of high molecular weight polyethylene suspended in a linear low density polyethylene carrier phase. Shearing flow was produced by a counter rotating couette device and elongational flow was produced by means of a four roller mill device. Deformation and bursting of droplets were observed in both of these flows however shearing flow was found unsuitable for quantitative studies since the orientation of the optical axes in the carrier and suspended phases were not coaxial. Hot stage and dichroism studies indicated that crystallization occurs in the suspended phase in the four roller mill at temperatures above which quiescent crystallization would occur. In situ birefringence measurements were made and initial crystallization rates were determined and found to depend upon both stress and strain in the deforming droplet. This was very suggestive of a viscoelastic phenomenon not simply a nucleation and growth controlled mechanism thus the separability of flow effects and nucleation and growth crystallization is brought into question by this complex behavior. A first order approximation based on molecular rheology has been used to gain qualitative and quantitative insights on the observed trends. **Rheo-Physics of Multiphase Polymer Systems** Kai Sondergaard, J. Lyngaae-Jorgensen, 1995-06-02. FROM THE PREFACE Almost all polymeric systems are subjected to a flow field at least once along the route between preparation and application. There is also an increased interest in predictive models on phase behavior and suitable techniques for characterizing the structure of these systems when subjected to flow. Multiphase polymeric systems are particularly susceptible to flow which may cause orientation of species, morphological changes and phase transitions. All these events may in turn affect the end product properties such as permeability, electrical conductivity and mechanical properties. In processing escalating needs have evolved for optimization

and development of novel and more uniform product properties and increased productivity In order to arrive at an understanding of processing polymeric systems under elastic flow conditions it is convenient to analyze the basic physical mechanisms under conditions that enable development of predictive models in conjunction with controlled experimentation In recent years the science of rheo physics has evolved and now involves both advanced theories and experimental techniques Rheo physics means the rheological morphological and thermodynamic behavior of structured polymer systems during flow In this monograph the rheo optical techniques are emphasized The book gives an introduction to rheo physics including fundamentals of theories and a representative selection of applications of rheo optical techniques for analyzing multiphase systems The chapters contain both practical advice for the new experimenter as well as review material for the experienced scientist

**Liquid Crystalline Polymers** Vijay Kumar Thakur, Michael R. Kessler, 2015-11-16 This book introduces anisotropic innovations in liquid crystalline polymers as well as new nanocomposite materials and testing techniques The authors detail the newest discoveries of material properties material types and phases and material characterization This interdisciplinary work creates valuable links that strengthen the approach to the evolving field of liquid crystalline polymers materials

*Nonlinear Phenomena in Flows of Viscoelastic Polymer Fluids* A.I. Leonov, A.N. Prokunin, 2012-12-06 This monograph presents theoretical and experimental studies of flows of elastic liquids Falling into this category are particularly the melts and concentrated solutions of such flexible chain polymers as polyethylene polyisobutylene and polypropylene all of which are widely used in polymer processing These polydisperse polymers vary greatly from batch to batch in their mechanical properties and 20% variation in a property is believed to be good enough 17 All recent books devoted to the rheology of polymers do not answer the question of which constitutive equations should be used for solving the fluid mechanic problems of polymer processing in the usual case of an appreciable nonlinear region of deformation where nonlinear effects of shear and extensional elasticity are very important Viscoelastic constitutive equations cited commonly see e g Refs 5 and 6 do not describe simultaneously even the simplest cases of deformations viz simple shear and uniaxial extension Moreover some of them are internally inconsistent and sometimes display highly unstable behaviour in simple flows without any fundamental reasons Even more respected molecular approaches free from these defects

*Crystallization in Multiphase Polymer Systems* Sabu Thomas, Mohammed Arif P., E. Bhoje Gowd, Nandakumar Kalarikkal, 2017-09-15 Crystallization in Multiphase Polymer Systems is the first book that explains in depth the crystallization behavior of multiphase polymer systems Polymeric structures are more complex in nature than other material structures due to their significant structural disorder Most of the polymers used today are semicrystalline and the subject of crystallization is still one of the major issues relating to the performance of semicrystalline polymers in the modern polymer industry The study of the crystallization processes crystalline morphologies and other phase transitions is of great significance for the understanding the structure property relationships of these systems Crystallization in block copolymers

miscible blends immiscible blends and polymer composites and nanocomposites is thoroughly discussed and represents the core coverage of this book The book critically analyzes the kinetics of nucleation and growth process of the crystalline phases in multi component polymer systems in different length scales from macro to nanoscale Various experimental techniques used for the characterization of polymer crystallization process are discussed Written by experts in the field of polymer crystallization this book is a unique source and enables professionals and students to understand crystallization behavior in multiphase polymer systems such as block copolymers polymer blends composites and nanocomposites Covers crystallization of multiphase polymer systems including copolymers blends and nanocomposites Features comprehensive detailed information about the basic research practical applications and new developments for these polymeric materials Analyzes the kinetics of nucleation and growth process of the crystalline phases in multi component polymer systems in different length scales from macro to nanoscale

*Additive Manufacturing of Functional Polymers and Nanocomposites* Chaudhery Mustansar Hussain,Kalim Deshmukh,2025-04-29 Additive Manufacturing of Functional Polymers and Nanocomposites Recent Progress Applications Challenges and Future Opportunities provides up to date knowledge in this important research field The book provides a comprehensive overview of the whole development phase from material synthesis to component design and manufacturing and applications The contents are divided into five key parts Section 1 introduces additive manufacturing of functional polymers and nanocomposites and discusses the numerous developments and perspectives that have been perceived over recent years Section 2 looks at the various types of functional polymers and nanocomposite materials including their characterization and the various synthesis techniques that can be employed to fabricate customized objects using AM technologies Section 3 focuses on the use of functional polymers and nanocomposites in a broad range of applications including health care electronics automotive robotics aerospace and other industrial sectors Section 4 focuses on theoretical modeling and machine learning approaches Section 5 discusses key challenges the environmental and health impact commercialization aspects and opportunities for the future Focuses on additive manufacturing of functional polymers and nanocomposites Covers fundamental aspects of additive manufacturing and materials processing techniques used to obtain optimized product design Covers a broad range of progressive additive manufacturing techniques Provides detailed information on additively manufactured smart structures and customized parts for different applications Presents recent studies in a fast evolving scientific research field

**Modeling and Optimization of Flow-induced Crystallization in Polymer Processing** Tsung-Chieh Tsai,1997 **Handbook of Polymer Crystallization** Ewa Piorkowska,Gregory C.

Rutledge,2013-07-01 Polymeric crystals are more complex in nature than other materials crystal structures due to significant structural disorder present The only comprehensive reference on polymer crystallization Handbook of Polymer Crystallization provides readers with a broad in depth guide on the subject covering the numerous problems encountered during crystallization as well as solutions to resolve those problems to achieve the desired result Edited by leading

authorities in the field topics explored include neat polymers heterogeneous systems polymer blends polymer composites orientation induced crystallization crystallization in nanocomposites and crystallization in complex thermal processing conditions *Rheology and Processing of Polymeric Materials* Chang Dae Han, 2007-06-04 Volume 2 presents the fundamental principles related to polymer processing operations including the processing of thermoplastic polymers and thermosets The objective of this volume is not to provide recipes that necessarily guarantee better product quality Rather emphasis is placed on presenting a fundamental approach to effectively analyze processing operations The specific polymer processing operations for thermoplastics include plasticating single screw extrusion morphology evolution during compounding of polymer blends compatibilization of immiscible polymer blends wire coating extrusion fiber spinning tubular film blowing coextrusion and thermoplastic foam extrusion The specific polymer processing operations for thermosets include reaction injection molding pultrusion of fiber reinforced thermosets and compression molding of thermoset composites **Flow Induced Orientation in Seeded Crystallization of Polymers** Issam Salah Dairanieh, 1982

**Thermal Analysis of Polymeric Materials** Krzysztof Pielichowski, Kinga Pielichowska, 2022-06-01 An all in one reference work covering the essential principles and techniques on thermal behavior and response of polymeric materials This book delivers a detailed understanding of the thermal behavior of polymeric materials evaluated by thermal analysis methods It covers the most widely applied principles which are used in method development to substantiate what happens upon heating of polymers It also reviews the key application areas of polymers in materials science Edited by two experts in the field the book covers a wide range of specific topics within the aforementioned categories of discussion such as Crucial thermal phenomena glass transition crystallization behavior and curing kinetics Polymeric materials that have gained considerable interest over the last decade The latest advancements in techniques related to the field such as modulated temperature DSC and fast scanning calorimetry The recent advances in hyphenated techniques and their applications Polymer chemists chemical engineers materials scientists and process engineers can use this comprehensive reference work to gain clarity on the topics discussed within and learn how to harness them in practical applications across a wide range of disciplines **A Continuum Model for Flow-induced Crystallization of Polymer Melts** Antonios K. Doufas, 1998

Mechanistic Kinetic Modeling of Flow-induced Crystallization in Semi-crystalline Polymers Lindsay Mendes, 1998

*Principles of Polymer Processing* Zehev Tadmor, Costas G. Gogos, 2006-06-16 Thoroughly revised edition of the classic text on polymer processing The Second Edition brings the classic text on polymer processing thoroughly up to date with the latest fundamental developments in polymer processing while retaining the critically acclaimed approach of the First Edition Readers are provided with the complete panorama of polymer processing starting with fundamental concepts through the latest current industry practices and future directions All the chapters have been revised and updated and four new chapters have been added to introduce the latest developments Readers familiar with the First Edition will discover a host of new

material including Blend and alloy microstructuring Twin screw based melting and chaotic mixing mechanisms Reactive processing Devolatilization theory mechanisms and industrial practice Compounding theory and industrial practice The increasingly important role of computational fluid mechanics A systematic approach to machine configuration design The Second Edition expands on the unique approach that distinguishes it from comparative texts Rather than focus on specific processing methods the authors assert that polymers have a similar experience in any processing machine and that these experiences can be described by a set of elementary processing steps that prepare the polymer for any of the shaping methods On the other hand the authors do emphasize the unique features of particular polymer processing methods and machines including the particular elementary step and shaping mechanisms and geometrical solutions Replete with problem sets and a solutions manual for instructors this textbook is recommended for undergraduate and graduate students in chemical engineering and polymer and materials engineering and science It will also prove invaluable for industry professionals as a fundamental polymer processing analysis and synthesis reference

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