



# Mesophase Formation in Discotic Liquid Crystalline Polymers

PHILIP KUMAR

# Mesophase Formation In Discotic Liquid Crystalline Polymers

**P. H. J. Kouwer**



## **Mesophase Formation In Discotic Liquid Crystalline Polymers:**

**Mesophase Formation in Discotic Liquid Crystalline Polymers** P. H. J. Kouwer, 2002-01-01 Chemistry of Discotic Liquid Crystals Sandeep Kumar, 2016-04-19 The self contained properties of discotic liquid crystals DLCs render them powerful functional materials for many semiconducting device applications and models for energy and charge migration in self organized dynamic functional soft materials The past three decades have seen tremendous interest in this area fueled primarily by the possibility

**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

Liquid Crystalline and Mesomorphic Polymers Valery P. Shibaev, Lui Lam, 2012-12-06 Among the various new directions in modern polymer science the design and investigation of liquid crystal LC polymers have been the ones growing most actively and fruitfully In spite of that the possible formation of an anisotropic LC phase was only demonstrated theoretically for the first time in the 1950s by Onsager 1 and Flory 2 and then experimentally verified in the studies with polypeptides solutions In essence the studies of these LC lyotropic systems did not deviate from the theme of purely academic interest It was at the beginning of the 1970s that the experimental explosion occurred when aromatic polyamides were synthesized and their ability to form LC solutions in certain very aggressive solvents was discovered The search for practical applications of such LC systems was crowned with the successful creation of the new generation of ultrastrong high modulus thermotropic fibers such as the Kevlar due to the high degree of order of the macromolecules in the anisotropic LC state In fact these investigations coincided with the swift emergence on the practical scene of thermotropic low molar mass liquid crystals with the use of these materials in microelectronics and electro optics figures and letters indicators displays in personal computers and flat TV etc Polymer scientists also began to develop methods of synthesizing thermotropic LC polymers by incorporating mesogenic fragments in the main chain LC polymers or side branchings of the macromolecules side chain or comb shaped polymers

Liquid Crystalline Semiconductors Richard J. Bushby, Stephen M. Kelly, Mary O'Neill, 2012-11-28 This is an exciting stage in the development of organic electronics It is no longer an area of purely academic interest as increasingly real applications are being developed some of which are beginning to come on stream Areas that have already been commercially developed or which are under intensive development include organic light emitting diodes for flat panel displays and solid state lighting organic photovoltaic cells organic thin film transistors for smart tags and flat panel displays and sensors Within the family of organic electronic materials liquid crystals are relative newcomers The first electronically conducting liquid crystals were reported in 1988 but already a substantial literature has developed The advantage of liquid crystalline semiconductors is that they have the easy processability of

amorphous and polymeric semiconductors but they usually have higher charge carrier mobilities Their mobilities do not reach the levels seen in crystalline organics but they circumvent all of the difficult issues of controlling crystal growth and morphology Liquid crystals self organise they can be aligned by fields and surface forces and because of their fluid nature defects in liquid crystal structures readily self heal With these matters in mind this is an opportune moment to bring together a volume on the subject of Liquid Crystalline Semiconductors The field is already too large to cover in a comprehensive manner so the aim has been to bring together contributions from leading researchers which cover the main areas of the chemistry synthesis and structure function relationships physics charge transport mechanisms and optical properties and potential applications in photovoltaics organic light emitting diodes OLEDs and organic field effect transistors OFETs This book will provide a useful introduction to the field for those in both industry and academia and it is hoped that it will help to stimulate future developments

**Structure And Transport Properties In Organized Polymeric Materials** Emo Chiellini,Marco Giordano,Dino Leporini,1998-03-19 This multi authored book includes selected contributions reviewing the results achieved in the synthesis and characterization of organized polymeric materials The focus is on competitive materials with liquid crystalline or electroconductive properties The fine tuning of the properties offered by advanced chemical synthesis has been investigated by a large number of state of the art techniques including both microscopic ESR NMR dielectrometry fluorescence IR Raman spectroscopy and macroscopic calorimetric mechanical methodologies The book also provides an updated coverage of the most challenging applications of organized polymers as functional materials in the fields of electrooptical devices information retrieval and organic electroconductors

**Liquid Crystal Polymers** D. Coates,2000 Liquid crystal polymers LCPs have a wide range of uses from strong engineering plastics to delicate gels for use in liquid crystal LC displays For this reason it is essential reading for materials scientists engineers or technologists in industry as well as research laboratories or academia An additional indexed section containing several hundred abstracts from the Rapra Polymer Library database gives useful references for further reading

**Introduction to Physical Polymer Science** Leslie H. Sperling,2005-12-07 An Updated Edition of the Classic Text Polymers constitute the basis for the plastics rubber adhesives fiber and coating industries The Fourth Edition of Introduction to Physical Polymer Science acknowledges the industrial success of polymers and the advancements made in the field while continuing to deliver the comprehensive introduction to polymer science that made its predecessors classic texts The Fourth Edition continues its coverage of amorphous and crystalline materials glass transitions rubber elasticity and mechanical behavior and offers updated discussions of polymer blends composites and interfaces as well as such basics as molecular weight determination Thus interrelationships among molecular structure morphology and mechanical behavior of polymers continue to provide much of the value of the book Newly introduced topics include Nanocomposites including carbon nanotubes and exfoliated montmorillonite clays The structure motions and functions of DNA and proteins as well as the interfaces of polymeric

biomaterials with living organisms The glass transition behavior of nano thin plastic films In addition new sections have been included on fire retardancy friction and wear optical tweezers and more Introduction to Physical Polymer Science Fourth Edition provides both an essential introduction to the field as well as an entry point to the latest research and developments in polymer science and engineering making it an indispensable text for chemistry chemical engineering materials science and engineering and polymer science and engineering students and professionals **Thermotropic Liquid Crystals**

Ayyalusamy Ramamoorthy, 2007-05-06 This book covers developments in the field of thermotropic liquid crystals and their functional importance It also presents advances related to different sub areas pertinent to this interdisciplinary area of research This text brings together research from synthetic scientists and spectroscopists and attempts to bridge the gaps between these areas New physical techniques that are powerful in characterizing these materials are discussed Reflexive

Polymers and Hydrogels Nobuhiko Yui, Randall J. Mersny, Kinam Park, 2004-03-17 Despite their capacity to carry out functions that previously were unobtainable smart polymers and hydrogels tend to have painfully slow response times On the other hand biological systems go through phase changes at an extremely fast rate Reflexive Polymers and Hydrogels examines the natural systems that respond almost instantaneously to environmental stimuli and thus gives the reader an understanding of the mechanisms that govern these responses The book includes chapters on approaches and procedures for designing a synthetic flash system based on naturally occurring systems It also deals with some of the promising potential applications of flash systems in industry *Research in Progress*, 1990 *Research in Progress* United States. Army Research Office, 1990 Vols for 1977 consist of two parts Chemistry biological sciences engineering sciences metallurgy and materials science issued in the spring and Physics electronics mathematics geosciences issued in the fall **Polymer Science: A**

**Comprehensive Reference**, 2012-12-05 The progress in polymer science is revealed in the chapters of Polymer Science A Comprehensive Reference Ten Volume Set In Volume 1 this is reflected in the improved understanding of the properties of polymers in solution in bulk and in confined situations such as in thin films Volume 2 addresses new characterization techniques such as high resolution optical microscopy scanning probe microscopy and other procedures for surface and interface characterization Volume 3 presents the great progress achieved in precise synthetic polymerization techniques for vinyl monomers to control macromolecular architecture the development of metallocene and post metallocene catalysis for olefin polymerization new ionic polymerization procedures and atom transfer radical polymerization nitroxide mediated polymerization and reversible addition fragmentation chain transfer systems as the most often used controlled living radical polymerization methods Volume 4 is devoted to kinetics mechanisms and applications of ring opening polymerization of heterocyclic monomers and cycloolefins ROMP as well as to various less common polymerization techniques Polycondensation and non chain polymerizations including dendrimer synthesis and various click procedures are covered in Volume 5 Volume 6 focuses on several aspects of controlled macromolecular architectures and soft nano objects including

hybrids and bioconjugates Many of the achievements would have not been possible without new characterization techniques like AFM that allowed direct imaging of single molecules and nano objects with a precision available only recently An entirely new aspect in polymer science is based on the combination of bottom up methods such as polymer synthesis and molecularly programmed self assembly with top down structuring such as lithography and surface templating as presented in Volume 7 It encompasses polymer and nanoparticle assembly in bulk and under confined conditions or influenced by an external field including thin films inorganic organic hybrids or nanofibers Volume 8 expands these concepts focusing on applications in advanced technologies e g in electronic industry and centers on combination with top down approach and functional properties like conductivity Another type of functionality that is of rapidly increasing importance in polymer science is introduced in volume 9 It deals with various aspects of polymers in biology and medicine including the response of living cells and tissue to the contact with biofunctional particles and surfaces The last volume is devoted to the scope and potential provided by environmentally benign and green polymers as well as energy related polymers They discuss new technologies needed for a sustainable economy in our world of limited resources Provides broad and in depth coverage of all aspects of polymer science from synthesis polymerization properties and characterization methods and techniques to nanostructures sustainability and energy and biomedical uses of polymers Provides a definitive source for those entering or researching in this area by integrating the multidisciplinary aspects of the science into one unique up to date reference work Electronic version has complete cross referencing and multi media components Volume editors are world experts in their field including a Nobel Prize winner

*Mechanical and Thermophysical Properties of Polymer Liquid Crystals* Witold Brostow, 2013-11-27

may never overcome the effects of hysteresis and stress see Chapters 6 and 12 The first sentence of the reference work Handbook of Liquid Crystals reads The terms liquid crystals crystalline liquid mesophase and mesomorphous state are used synonymously to describe a state of aggregation that exhibits a molecular order in a size range similar to that of a crystal but acts more or less as a viscous liquid 2 In other words molecules within a liquid crystalline phase possess some orientational order and lack positional order furthermore the shape of a liquid crystalline sample is determined by the vessel in which it is contained rather than by the orientational order of its aggregated molecules The authors recognized the limitations and imprecision of this definition but like others preceding them could not devise a simple and generally applicable one that is better Regardless the terms liquid crystal and mesophase should not be used interchangeably As mentioned above all liquid crystals are mesophases but all mesophases are not liquid crystals Recent studies employing elaborate and sophisticated analytical techniques have permitted finer distinctions between classical crystals and mesophases At the same time they have made definitions like that from the Handbook of Liquid Crystals somewhat obsolete for reasons other than terminology One part of the problem arises from the use of a combination of bulk properties like flow and microscopic properties like molecular ordering within the same definition

**Macromolecular Design of Polymeric Materials** Hatada, 1997-01-02

Providing a range of information on polymers and polymerization techniques this text covers the gamut of polymer science from synthesis structure and properties to function and applications It analyzes speciality polymers including acrylics fluoropolymers polysilanes polyphosphazenes and inorganic and conducting polymers The book examines the stereochemistry of polymerization and the stereoregularity of polymers

*Design and Applications of Nanostructured Polymer Blends and Nanocomposite Systems* Sabu Thomas, Robert Shanks, Sarath Chandran, 2015-09-22 Design and Applications of Nanostructured Polymer Blend and Nanocomposite Systems offers readers an intelligent thorough introduction to the design and applications of this new generation of designer polymers with customized properties The book assembles and covers in a unified way the state of the art developments of this less explored type of material With a focus on nanostructured polymer blends the book discusses the science of nanostructure formation and the potential performance benefits of nanostructured polymer blends and composites for applications across many sectors electronics coatings adhesives energy photovoltaics aerospace automotive and medical devices biocompatible polymers The book also describes the design morphology and structure of nanostructured polymer composites and blends to achieve specific properties Covers all important information for designing and selecting the right nanostructured polymer system Provides specialized knowledge on self repairing nanofibre and nanostructured multiphase materials as well as evaluation and testing of nanostructured polymer systems Serves as a reference guide for development of new products in industries ranging from electronics coatings and energy to transport and medical applications Describes the design morphology and structure of nanostructured polymer composites and blends to achieve specific properties

**Handbook of Liquid Crystals, 8 Volume Set** John W. Goodby, Peter J. Collings, Takashi Kato, Carsten Tschierske, Helen Gleeson, Peter Raynes, Volkmar Vill, 2014-04-14 Much more than a slight revision this second edition of the successful Handbook of Liquid Crystals is completely restructured and streamlined with updated as well as completely new topics 100% more content and a new team of editors and authors As such it fills the gap for a definitive single source reference for all those working in the field of organized fluids and will set the standard for the next decade The Handbook's new structure facilitates navigation and combines the presentation of the content by topic and by liquid crystal type A fundamentals volume sets the stage for an understanding of the liquid crystal state of matter while individual volumes cover the main types and forms with a final volume bringing together the diverse liquid crystal phases through their applications This unrivaled all embracing coverage represents the undiluted knowledge on liquid crystals making the Handbook a must have wherever liquid crystals are investigated produced or used and in institutions where their science and technology is taught Also available electronically on Wiley Online Library [www.wileyonlinelibrary.com/ref/holc](http://www.wileyonlinelibrary.com/ref/holc) Volume 1 Fundamentals of Liquid Crystals Volume 2 Physical Properties and Phase Behavior of Liquid Crystals Volume 3 Nematic and Chiral Nematic Liquid Crystals Volume 4 Smectic and Columnar Liquid Crystals Volume 5 Non Conventional Liquid Crystals Volume 6 Nanostructured and Amphiphilic Liquid Crystals Volume 7

Supermolecular and Polymeric Liquid Crystals Volume 8 Applications of Liquid Crystals      **Handbook of Liquid Crystal Research** Peter J. Collings, 1997 The Handbook of Liquid Crystal Research deals with all the important recent advances in liquid crystalline materials It contains in one volume the results of technical and theoretical work done in the last 15 years

**Polymer Structure Characterization** Richard A Pethrick, 2015-10-20 The different physical properties displayed by low molar mass organic materials and polymers are a result of their molecular organisation In order to understand the structure property relationship of a material it is necessary to first look at the interactions at a molecular level This new edition of Polymer Structure Characterization provides readers with the background needed to understand the factors that influence molecular organization and how this affects the morphology and bulk physical properties of a material In order to introduce the concepts the book first looks at small molecular systems and builds up to complex macromolecular systems The second edition has been fully revised and updated to include new examples and references Topics covered include organic crystals liquid crystals plastic crystals polymer crystal growth amorphous glassy materials polymer surfaces and interfaces colloids and molecular organization in liquids as well as two new chapters on self assembly and biopolymer systems The book is intended to provide complimentary material for a range of undergraduate and postgraduate courses in materials science molecular chemistry and chemical physics In addition to polymer and material scientists the book would also be of interest to chemists and physicists studying the properties of organic materials      Soft Materials-Based Biosensing Medical

Applications Deepak Gupta, Milan Singh, Rishabha Malviya, Sonali Sundram, 2025-06-04 The book offers a comprehensive interdisciplinary overview of how innovative soft materials are revolutionizing biosensing technologies making it an essential read for anyone interested in cutting edge advancements in biomedical research and healthcare Soft materials include granular materials foams gels polymers surfactants functional organics and biological molecules These structures can be altered by thermal or mechanical stress due to their ability to self organize into mesoscopic physical structures They are becoming increasingly significant as functional materials for broader applications because of their rich surface chemistry and versatile functions A biosensor is an analytical tool for chemical compound detection that combines a biological element with a physicochemical detector Sensitive biological components such as proteins carbohydrates tissue bacteria and enzymes are collected from a biomimetic element that interacts and binds with the analyte under investigation In biosensors soft matter may function as both a sensing and transducing component The interplay of soft matter with biomolecular analytes results in cell signaling pathways diagnostic tests for applications in low resource environments prospective drug development molecular biodetection chemical sensors and biological sensors Understanding these biomolecular interactions in the context of acute illnesses is critical for biomedical research and healthcare This has fueled efforts to create a biosensor that is effective low cost and label free Several approaches using soft materials to functionalize and tailor structures have greatly advanced science including chemistry physics pharmaceutical science materials science and engineering Soft Materials



Based Biosensing Medical Applications summarizes recent advances in soft materials with unique physicochemical properties that synergistically promote biosensing systems Audience The book will be read by researchers materials scientists electronic and AI engineers as well as pharmaceutical and biomedical professionals interested in the uses of biosensing

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