

Side Chain Liquid Crystal Polymers (SCLCPs)

Terminally Attached

Polymer backbone

Spacer unit

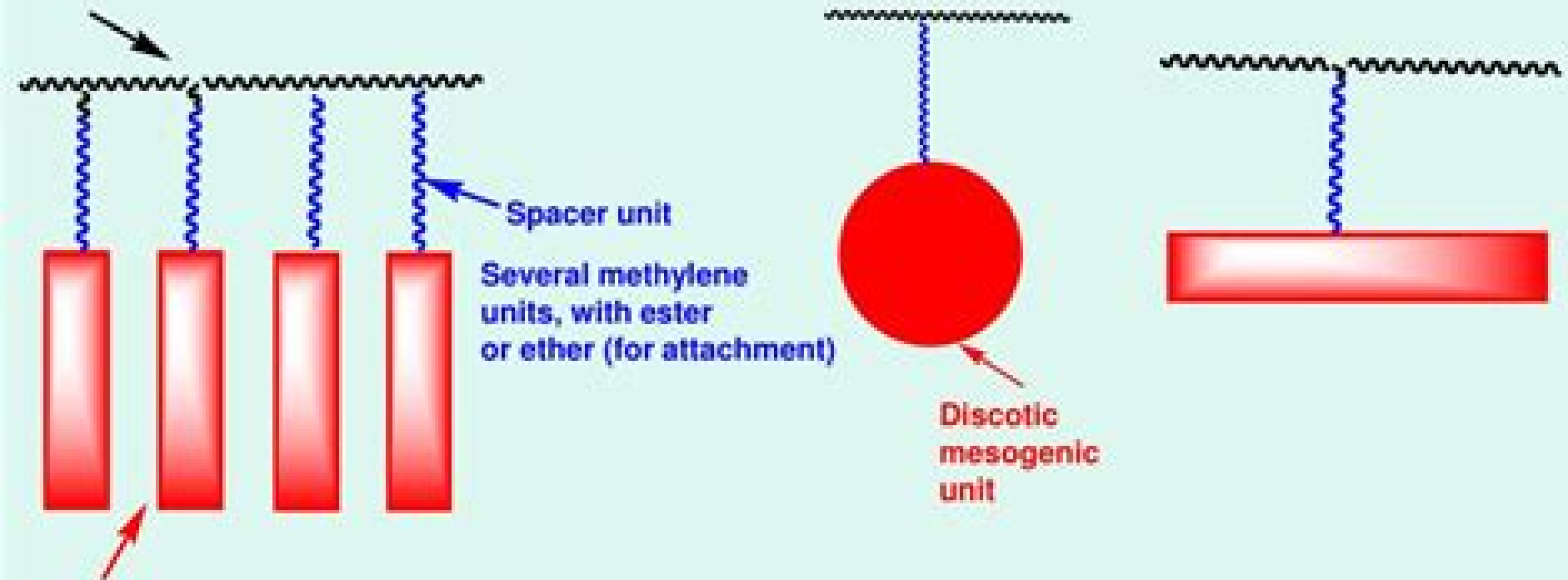
Several methylene units, with ester or ether (for attachment)

Calamitic mesogenic unit

Laterally Attached

Discotic mesogenic unit

A general template for side chain liquid crystal polymers



Side Chain Liquid Crystal Polymers

Philip James Smith



Side Chain Liquid Crystal Polymers:

Side Chain Liquid Crystal Polymers C.B. McArdle, 1990-04-30 *Theoretical Predictions for Side-chain Liquid-crystal Polymers and Comparison to Experiment*, 1988 This paper presents results from a new unique microscopic molecular theory for side chain liquid crystalline polymers LCPs in the nematic N and multiple smectic A SA LC phases and the isotropic I liquid phase There are no ad hoc or arbitrarily adjustable parameters in this theory The agreement between the theoretical and experimental values for various properties including transition temperatures and quadratic characteristic radii is very good relative deviations between 0% and less than 6.2% The theoretical results also show for the first time that the N and I phases for these LCPs involve the packing of plate like sections of backbones and side chains and that the local bilayer SA phase involves packing of side chains within a plate like section This type of packing is predicted to be typical for side chain LCPs This theory can predict for the first time whether the side chains of a molecule pack on the same or alternating opposite sides of the backbone and whether side chains on different molecules interdigitate overlap with each other 13 refs 1 fig 4 tabs

Liquid Crystalline Polymers Xin-jiu Wang, Qi-feng Zhou, 2004-04-14 This textbook consists of six chapters The first chapter highlights the concept of liquid crystals including chemical structure phase classification defect and texture and continuum theory It has been carefully written to meet the needs of readers who do not specialize in liquid crystals The second chapter is related to the theoretical description of liquid crystalline polymers networks and gels which deals with subjects such as the formation of liquid crystallinity in the polymer system the phase transition and phase diagram the molecular weight effect chain conformation physics properties etc In Chapter 3 the molecular engineering of liquid crystalline polymers is introduced The molecular composition and the molecular weight play essential roles in the molecular design which are reviewed in detail In addition some unusual liquid crystalline polymers are discussed Chapter 4 is devoted to the phase identification of liquid crystalline polymers The techniques involved cover polarizing microscopy thermal analysis X ray diffraction and other areas Chapters 5 and 6 summarize the properties and applications of liquid crystalline polymers Chapter 5 deals mainly with mechanical performance in fiber and composites Chapter 6 presents the elasticity viscosity and rheology of liquid crystalline polymers as well as other important properties

Synthesis of Side Chain Liquid Crystal Polymers by Living Ring Opening Metathesis Polymerization. 4. Synthesis of Amorphous and Side Chain Liquid Crystal AB Block Copolymers, 1992 Diblock copolymers with well defined block length yield ordered phase separation Morphology of the microphase separation is controllable by varying the weight ratio of the two blocks and the length of each block If one of the blocks is a side chain liquid crystalline polymer SCLCP microphase separated systems with liquid crystalline microphases may be realized Such systems are of fundamental as well as practical interest The effect of size and type of the liquid crystalline microphase transition is one of the fundamental questions This effect is recently investigated by the polymer system in which low molecular weight liquid crystals are dispersed Different from the low molecular weight

liquid crystals dispersed systems the block copolymer can give several types of microdomains lamellae cylinders or spheres

Synthesis of Novel Side Chain Liquid Crystal Polymers Paul Rostron,1996 The Synthesis and Evaluation of Side Chain Liquid Crystal Polymers Philip James Smith,1993 **Synthesis of Side-chain Liquid Crystal Polymers by**

Cyclopolymerisation Peter Buxton,1998 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 **Liquid Crystals** Shri Singh,David A. Dunmur,2002 Liquid crystals are partially ordered systems without a rigid long range structure The study of these materials covers a wide area chemical structure physical properties and technical applications Due to their dual nature anisotropic physical properties of solids and rheological behavior of liquids and easy response to externally applied electric magnetic optical and surface fields liquid crystals are of greatest potential for scientific and technological applications The subject has come of age and has achieved the status of being a very exciting interdisciplinary field of scientific and industrial research This book is an outgrowth of the enormous advances made during the last three decades in both our understanding of liquid crystals and our ability to use them in applications It presents a systematic self contained and up to date overview of the structure and properties of liquid crystals It will be of great value to graduates and research workers in condensed matter physics chemical physics biology materials science chemical and electrical engineering and technology from a materials science and physics viewpoint of liquid crystals

Synthesis of Side Chain Liquid Crystal Polymers by Living Ring Opening Metathesis Polymerization. 1. Influence of Molecular Weight, Polydispersity, and Flexible Spacer Length (n,1992 The living ring opening metathesis polymerization of 5-carbon 4-methoxy-4-biphenyl-yl-oxy-alkyl-bicyclo[2.2.1]hept-2-ene-1-n₂ by Mo-CH₃-t-Bu-NAr-0-t-Bu-2-Ar-2-6-C₆H₃-t-Pr₂ is described Polymers with degrees of polymerization from 5 to 100 and narrow molecular weight distributions Mw/Mn 1.05-1.24 were obtained in high yield All polymers exhibit an enantiomorphic nematic mesophase Glass transition and isotropization temperatures increase with increasing molecular weight and become independent at approximately 30-50 repeat units The change in enthalpy of isotropization is relatively independent of molecular weight Using polymer blends it was shown that polydispersity has no effect on either the transition temperatures or the temperature range of isotropization Isotropization alternates in an odd-even manner up to spacer lengths of n=6 and then levels off Living ring opening metathesis polymerization Side chain liquid crystalline polymers SCLCPs Structure-property Relationships in Side Chain Liquid Crystal Polymers Aileen A. Craig,1996 **The Synthesis and Characterisation of Laterally Attached Side Chain Liquid Crystal Polymers** Eric A. Whale,1993 **Synthesis and Characterisation of Chiral Side Chain Liquid Crystal Polymers** David Mearns Duncan,1997 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.

Synthesis and Structural Studies of Side-chain Liquid Crystal Polymers and Elastomers Andrew J. Symons, 1993

Side-chain Liquid Crystalline Polymers as Stimuli-responsive Materials Suk-kyun Ahn, 2011

Electro-optic Phenomena in Side-chain Liquid Crystal Polymers Khalid Hassan Bader Al-Ammar, 1991

Untersuchung des Fließverhaltens von flüssigkristallinen Polymeren Hartmut Siebert, 1999-01-18 Inhaltsangabe

Zusammenfassung: Es wurde das Fließverhalten von flüssigkristallinen Seiten- und Hauptkettenpolymeren untersucht. Um den Einfluss von Spacerlänge und smektischen Clustern auf das rheologische Verhalten der Seitenkettenpolymere zu ermitteln, wurden deuterierte Polysiloxanhomopolymere und statistische Copolymere mit unterschiedlichen Spacerlängen und Fließgruppen synthetisiert. Diese Polymere wurden unter Scherung erstmals vergleichend mit verschiedenen Methoden wie ^2H NMR Spektroskopie, Röntgenbeugung, Neutronenstreuung und Polarisationsmikroskopie untersucht. Zur Untersuchung von flüssigkristallinen Hauptkettenpolymeren wurden einige deuterierte Polyether synthetisiert. An diesen und weiteren Hauptkettenpolymeren wie dem Polyether DHMS 79 und PBLG in m-Kresol wurden erstmals simultan zur Scherung ^2H NMR Spektroskopie Messungen durchgeführt. Darüber hinaus wurden NMR Reorientierungsmessungen sowohl von Haupt- als auch von Seitenkettenpolymeren durchgeführt. Aus den ^2H NMR spektroskopischen Messungen unter Scherung konnte bestimmt werden, ob ein nematisches System vom Flow Aligning oder Tumbling Typ ist. Im Flow Aligning Fall orientiert sich der Direktor in der Scherebene, die von der Fließrichtung und dem Schergradienten aufgespannt wird, in einem einheitlichen Winkel zur Fließrichtung. Im Tumbling Fall dreht sich der Direktor kontinuierlich unter Scherung. Das Fließverhalten der untersuchten nematischen Seitenkettenpolymere lässt sich mit der Ericksen-Leslie-Parodi-Theorie quantitativ beschreiben. Im Rahmen dieser Theorie konnten die beiden Leslie-Viskositätskoeffizienten α_2 und α_3 bestimmt werden. Für einige Polysiloxane vom Flow Aligning Typ konnte mit ^2H NMR Messungen und Röntgenbeugungsexperimenten der Orientierungswinkel zur Fließrichtung bestimmt und eine Direktororientierung in der Scherebene nachgewiesen werden. Mit der Polarisationsmikroskopie wurde unter Scherung eine einheitliche Direktororientierung gefunden. Für einige Polysiloxane vom Tumbling Typ wurde mit ^2H NMR Messungen und Röntgenbeugungsexperimenten unter Scherung bei tiefen Temperaturen in der nematischen Phase eine weitgehende Direktororientierung in neutraler Richtung, das heißt senkrecht zur Scherebene, gefunden. Bei den Polymeren vom Tumbling Typ bildet sich unter Scherung keine einheitliche Direktororientierung, sondern eine sehr defektreiche Struktur, aus der während der Scherung durchgeführte polarisationsmikroskopische Aufnahmen zeigen. Bei

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