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A review of: "Electronic Materials: The Oligomer Approach, edited by K. Müllen and G. Wegner, Wiley-VCH, Weinheim, 1998; ISBN 3-527-29438-4; xxvii + 599 pages; DM 398.00; sFr 354.00"

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Book Review

(Received January 10, 1999)

“Electronic Materials: The Oligomer Approach”, edited by K. Müllen and G. Wegner, Wiley-VCH, Weinheim, 1998; ISBN 3-527-29438-4; xxvii + 599 pages; DM 398.00; sFr 354.00.

The editors, both directors of the Max-Planck-Institut für Polymerforschung in Mainz, are to be congratulated for assembling this book that will prove useful to readers ranging from beginning students to experienced senior researchers. The study of monodisperse oligomers, always an integral part of polymer research, takes on particular significance in the study of conjugated polymers for electronic and optical applications. As amply demonstrated in the book, not only do oligomers provide a framework for extrapolation of the structural and electronic properties of a polymer, but they also, in certain cases, have properties that are superior to those of polymers. Hence, the oligomers become electronic materials in their own right, and in certain device situations may become materials of choice. The reports of field effect mobilities in sexithiophenes that are several orders of magnitude higher than those of analogous polythiophenes illustrate this point.

The book consists of eleven sections (a total of fourteen individual chapters), all written by European authors, an index (15 pages), and a prefatory essay by the editors. The latter was also published as an essay at about the time that the book was published (*Adv. Mater.* 1998, 10, 433-436). The majority of the authors have chemical backgrounds, although the content of several of the chapters is quite physical. The section titles are Hydrocarbon Oligomers, Sulfur-Containing Oligomers (2 chapters), Nitrogen-Containing Oligomers, Oligomeric Metal Complexes, Crystal Structure (2 chapters), Structure and Properties of Conjugated Oligomers from their Vibrational Spectra, Electronic Excitation (2 chapters), Nonlinear Optical Properties of Oligomers, Electrochemical Properties, Optical Applications, Field-Effect Transistors Based on Conjugated Oligomers. Each chapter gives a comprehensive overview of its designated subject. The book is

replete with figures that plot data such as electronic absorption maximum, redox potential, vibrational frequency, or hyperpolarizability versus chain length (or its reciprocal) largely for the purpose of extrapolating to the relevant parameter for the polymer.

Several chapters held considerable appeal. The chapter on Hydrocarbon Oligomers by Geerts, Klärner, and Müllen is the longest in the book (103 pages). It is a valuable summary of diverse synthetic methods and spectral properties. The chapter Oligomers as Structural Models for polymers by V. Enkelmann should be required reading for students; the discussion of the role of endgroups on crystal packing is quite insightful. H. Bässler's chapter Electronic Excitations of Conjugated Oligomers clearly details the evolution of absorption and fluorescence spectra with increasing chain length and makes a good connection to the data for the corresponding polymers. C. Bubeck's chapter Nonlinear Optical Properties of Oligomers is a very good summary of both experimental and theoretical results concerning how both linear and nonlinear properties can vary with chain length. Bubeck's chapter also includes a valuable discussion of the various definitions of the term "effective conjugation length". This concept is at the heart of much discussion not only on the properties of oligomers, but also on the properties of the relevant polymers. Reference to this discussion is not found in the index under "Conjugation length" or "Effective conjugation length (ECL)", but under "Chain length-characteristic".

Despite its many attributes, the book is not without flaws. Many of the figure captions in the chapter dealing with vibrational spectra are not readily understood even after referring to the text. While Suzuki coupling (and other transition metal catalyzed couplings) is discussed in the chapters on hydrocarbons, thiophenes, and pyrroles, there is really not too much overlap in the individual chapters. On the minor side, Enkelmann has only one "n" in the Contents, and Belgium is misspelled ("Belguim") three times in the List of Contributors. Scheme 2 on p. 411 is missing a double bond.

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