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homologues; 1.4 Macrocyclic thiophenes; 1.4.1 Macrocycles based only on thiophenes; 1.4.2 Mixed macrocycles based on thiophenes and other unsaturated units; 1.4.3 Thiophene-based porphyrinoid macrocycles
1.5 Dendritic and hyperbranched oligothiophenes1.5.1 Star-shaped structures; 1.5.2 Tetrahedral oligothiophenes; 1.5.3 Functionalization of dendrimers with oligothiophenes at the periphery; 1.5.4 Oligothiophenes used as cores in dendrimers; 1.5.5 Functionalized all-thiophene dendrimers; 1.6 Conclusions and prospects; Acknowledgments; References; 2 Synthesis, characterization and properties of regioregular polythiophene-based materials; 2.1 Introduction; 2.1.1 Scope of the chapter; 2.1.2 Development of polythiophenes; 2.1.3 Nomenclature; 2.2 Consequences of regiochemistry
2.3 Synthesis of regioregular polythiophenes2.3.1 Survey of regioregular syntheses; 2.3.2 Mechanism of nickel-mediated cross-coupling polymerization; 2.3.3 Polymer modification: chain and termini; 2.3.4 Polymer modification: substituent; 2.4 Purification and fractionation; 2.5 Molecular characterization; 2.5.1 NMR spectroscopy; 2.5.2 UV-Vis spectroscopy; 2.5.3 MALDI-TOF-MS; 2.5.4 Light scattering studies of aggregates; 2.6 Solid-state studies; 2.6.1 Solid-state NMR spectroscopy; 2.6.2 Solid-state UV-Vis spectroscopy; 2.6.3 Solid-state vibrational spectroscopy (IR, Raman)
2.6.4 Solid-state X-ray studies2.6.5 Anisotropy; 2.6.6 Microscopy (AFM, STM); 2.6.7 Thermal analysis (DSC, TGA); 2.6.8 Charge carrier mobility; 2.7 Block copolymers containing regioregular polythiophenes; 2.8 Conclusions; References; 3 Fused oligothiophenes; 3.1 Introduction; 3.2 Synthesis and molecular properties of fused oligothiophenes; 3.2.1 Thienothiophenes; 3.2.2 Dithienothiophenes; 3.2.3 Linked bithiophenes; 3.2.4 Higher fused and linear oligothiophenes; 3.2.5 Cyclic and helical fused oligothiophenes; 3.3 Conclusion; References
4 Thiophene-S,S-dioxides as a class of electron-deficient materials for electronics and photonics

Sommario/riassunto

This essential resource consists of a series of critical reviews written by leading scientists, summarising the progress in the field of conjugated thiophene materials. It is an application-oriented book, giving a chemists' point of view on the state-of-art and perspectives of the field. While presenting a comprehensive coverage of thiophene-based materials and related applications, the aim is to show how the rational molecular design of materials can bring a new breadth to known device applications or even aid the development of novel application concepts. The main topics covered include synthetic methodologies to thiophene-based materials (including the chemistry of thiophene, preparation of oligomers and polymerisation approaches) and the structure and physical properties of oligo- and polythiophenes (discussion of structural effects on electronic and optical properties). Part of the book is devoted to the optical and semiconducting properties of conjugated thiophene materials for electronics and photonics, and the role of thiophene-based materials in nanotechnology.