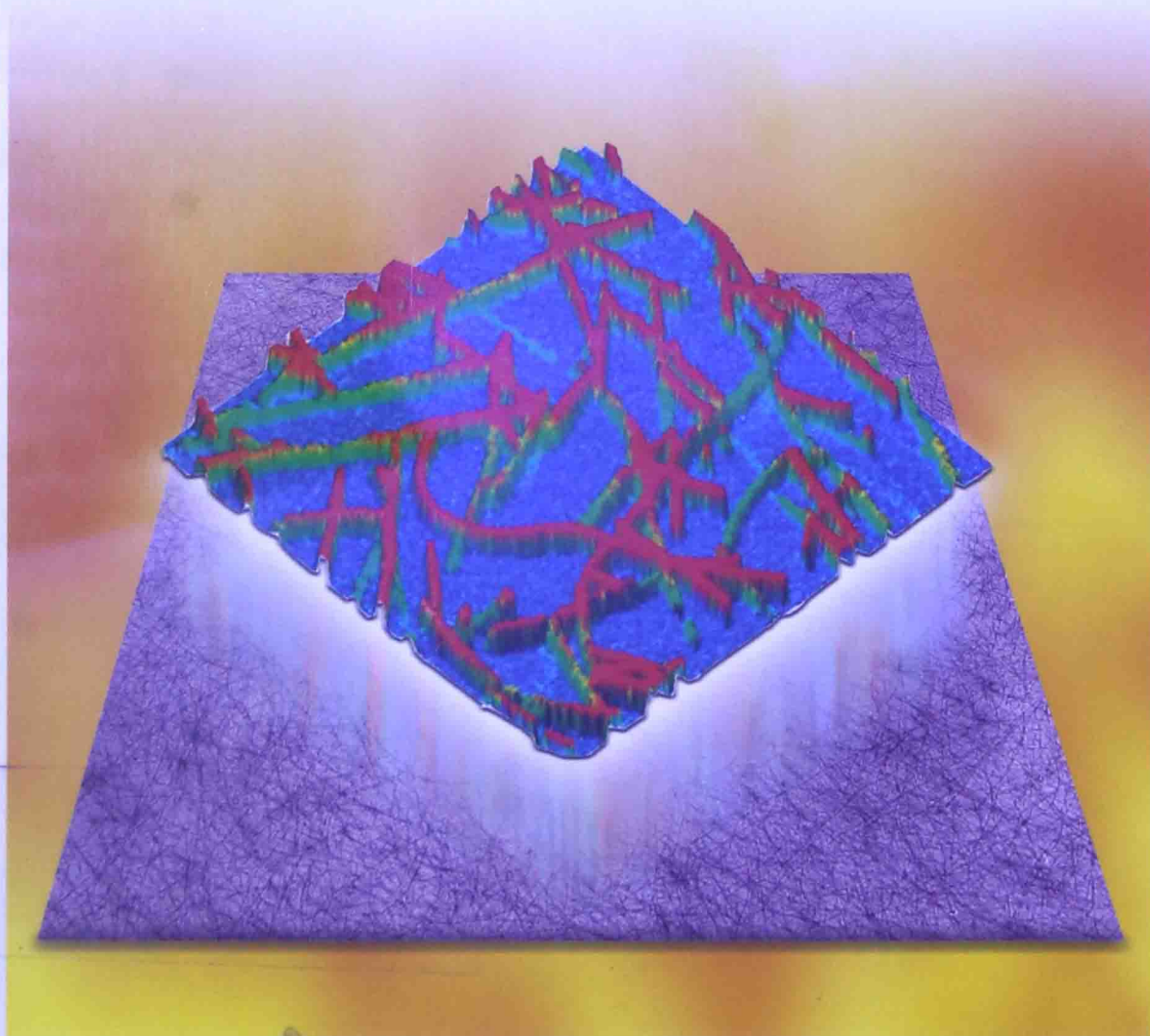


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Semiconducting Polymer Composites

Principles, Morphologies, Properties and Applications



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Principles, Morphologies, Properties and Applications



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Preface

The research on (semi-)conducting polymers has attracted dramatically increased attention from both academic and industrial communities. The commercial products based on these new materials, for example, polymer thin-film displays and polymer solar cells, are already available on the market. Solution-based thin-film deposition technology makes it possible to carry out large-scale device fabrication with very low cost, which has been regarded as the most attractive advantage of semiconducting polymers for applications in next-generation optoelectronic devices. In most cases, a composite instead of only one polymer species is employed to realize the specific functionality of the device, which results in more scientific questions that need to be answered, for example, with respect to morphological, interfacial, and mechanical properties as well as to charge transfer mechanisms within the composite film. A book collecting the already existing knowledge on the respective topics is necessary for new researchers to become acquainted with the field as well as for giving an overview and addressing the key questions within a short time. In addition, this book aims at giving a systematic and in-depth coverage of semiconducting polymer composites from their fundamental concepts to morphology control and their applications in real devices for researchers already working in the field. Consequently, particular attention is given to the unique advantages of semiconducting polymer composites where polymers with specific functionalities are employed to form a multicomponent material with a desired morphology in order to obtain required materials properties and high-performance devices.

This book contains three parts, where the first part describes the principles and concepts of semiconducting polymer composites, including the mechanism of morphology formation, morphology characterization, energy level alignment at interfaces, energy transfer between the components, percolation theory, and processing techniques. These composites can be classified into two categories in terms of functionality of the components, mainly the matrix polymer involved, which is detailed in Parts II and III, respectively. Part II discusses the semiconducting/insulating polymer composites where a conjugated polymer or an organic semiconductor is dispersed in an insulating polymer matrix, forming a composite with exceptional properties. Part III is concerned with semiconducting/semiconducting polymer composites where conjugated polymers are used as the matrix. The

applications of these composites in, for example, polymer solar cells, light-emitting diodes, transistors, and biosensors are presented.

I am greatly indebted to my colleagues who have been working in the respective fields for years and have agreed to contribute their expertise to this book. Their support made it possible to present the current state-of-the-art overview of semi-conducting polymer composites in terms of both its academic value and potential applications.

I would also like to thank the people at Wiley-VCH who offered me this opportunity initially, helped me to overcome numerous difficulties, and made it become reality eventually.

Changchun, China
April 2012

Xiaoni Yang

Contents

List of Contributors XV

Preface XXI

1	Solubility, Miscibility, and the Impact on Solid-State Morphology	1
	<i>Florian Machui and Christoph J. Brabec</i>	
1.1	Introduction	1
1.2	General Aspects	2
1.2.1	Solubility	3
1.2.2	Miscibility–Thermodynamic Relationships	5
1.3	Solubility, Solvents, and Solution Formulations	6
1.3.1	Solubility	6
1.3.2	Solvents	9
1.3.2.1	Impact of Different Solvents on the Solid-State Morphology	10
1.3.2.2	Non-Halogenic Solvents	14
1.3.2.3	Solvent Blends	15
1.3.2.4	Addition of Poor Solvents	16
1.3.2.5	Processing Additives	18
1.3.2.6	Solution Concentration	21
1.3.3	Conclusive Outlook	21
1.4	Miscibility	22
1.4.1	Methods	22
1.4.1.1	Glass Transition	23
1.4.1.2	Surface Energy	23
1.4.1.3	Photoluminescence Quenching	24
1.4.2	Polymer–Polymer Miscibility	26
1.4.3	Polymer–Fullerene Miscibility	28
1.4.4	Phase Diagrams	30
1.5	Conclusions	32
	References	34

2	Nanoscale Morphological Characterization for Semiconductive Polymer Blends	39
	<i>Joachim Loos</i>	
2.1	Introduction	39
2.2	The Importance of Morphology Control	40
2.3	The Classic Blend: MDMO-PPV/PCBM as a Model for an Amorphous Donor System	42
2.4	Intermezzo: Morphology Imaging with Scanning Transmission Electron Microscopy	48
2.5	Volume Characterization of the Photoactive Layer: Electron Tomography	50
2.6	Measuring Nanoscale Electrical Properties: Conductive AFM	56
2.7	Current Progress and Outlook	60
	References	62
 3	 Energy Level Alignment at Semiconductive Polymer Interfaces: Correlating Electronic Energy Levels and Electrical Conductivity	 65
	<i>Nobuo Ueno</i>	
3.1	Introduction	65
3.2	General View of Electronic Structure of Organic Solids	65
3.2.1	Introduction to Correlating Electronic Structure and Electrical Conductivity	65
3.2.2	Evolution of Electronic Structure from Single Molecule to Molecular Solid	67
3.2.3	Evolution of Electronic Structure from Single Atom to Polymer Chain	70
3.2.4	Polaron	72
3.2.5	Energy Level Alignment at the Interface	73
3.3	Experimental Methods	75
3.3.1	Ultraviolet Photoelectron Spectroscopy	75
3.3.2	Penning Ionization Electron Spectroscopy	78
3.4	Valence Electronic Structure of Organic Semiconductors: Small Molecules	79
3.4.1	Energy Band Dispersion and Band Transport Mobility	79
3.4.2	Electron–Phonon Coupling and Hopping Mobility	84
3.4.2.1	Fundamental Aspects on Charge Hopping	84
3.4.2.2	Reorganization Energy and Small Polaron Binding Energy	86
3.5	Valence Electronic Structure of Polymers	90
3.5.1	Quasi-One-Dimensional Band Dispersion Along Polymer Chains	90
3.5.1.1	σ -Bond Polymer	90
3.5.1.2	π -Conjugated Polymer Chain	91
3.5.2	Pendant Group Polymers: Is the Surface of Solution-Cast Film Clean on Molecular/Atomic Scale?	92

3.5.3	P3HT: Electronic Structure and Control of π -Electron Density Distribution at the Surface for Realizing a Functional Interface	93
3.6	Role of the Interface Dipole Layer: Its Impact on the Energy Level Alignment	101
3.7	Future Prospects	103
	References	103
4	Energy and Charge Transfer	107
	<i>Ralf Mauer, Ian A. Howard, and Frédéric Laquai</i>	
4.1	Introduction	107
4.2	Energy Transfer	108
4.2.1	Electronic Structure and Excited States of Conjugated Polymers	108
4.2.1.1	Excitons: The Nature of Excited States in Conjugated Polymers	108
4.2.2	Excited State Dynamics in Conjugated Polymers	113
4.2.2.1	Role of Disorder in Energy Transfer	113
4.2.2.2	Singlet Exciton Energy Transfer	114
4.2.2.3	Triplet Exciton Dynamics	115
4.2.3	Energy Transfer: Relevance to Device Performance	123
4.3	Charge Transfer in Polymer/Fullerene Composites	125
4.3.1	Theoretical Background	125
4.3.1.1	Theory of Charge Transfer	125
4.3.1.2	Theory of Field and Temperature Dependence of Charge Separation	129
4.3.2	The Role of Charge Transfer States for Charge Separation	131
4.3.2.1	Parameters Influencing the Separation of Charge Transfer States	133
4.3.3	Charge Transfer: Relevance to Device Performance	139
	References	140
5	Percolation Theory and Its Application in Electrically Conducting Materials	145
	<i>Isaac Balberg</i>	
5.1	Introduction	145
5.2	Lattice Percolation	146
5.3	Continuum Percolation	152
5.4	Percolation Behavior When the Interparticle Conduction Is by Tunneling	154
5.5	The Structure of Composite Materials	156
5.6	The Observations and Interpretations of the $\sigma(x)$ Dependence in Composite Materials	159
5.6.1	The Percolation Threshold	159
5.6.2	The Critical Behavior of $\sigma(x)$	161
5.7	Summary and Conclusions	165
	References	168

6	Processing Technologies of Semiconducting Polymer Composite Thin Films for Photovoltaic Cell Applications	171
	<i>Hui Joon Park and L. Jay Guo</i>	
6.1	Introduction	171
6.2	Optimization of Bulk Heterojunction Composite Nanostructures	173
6.3	Fabrication of Sub-20 nm Scale Semiconducting Polymer Nanostructure	182
6.3.1	Nanoimprint Mold Fabrication	183
6.4	Conclusions	186
	References	187
7	Thin-Film Transistors Based on Polythiophene/Insulating Polymer Composites with Enhanced Charge Transport	191
	<i>Longzhen Qiu, Xiaohong Wang, and Kilwon Cho</i>	
7.1	Introduction	191
7.2	Fundamental Principle and Operating Mode of OTFTs	193
7.3	Strategies for Preparing High-Performance OTFTs Based on Semiconducting/Insulating Blends	194
7.4	Blend Films with Vertical Stratified Structure	194
7.4.1	Phase Behavior of Polymer Blends	194
7.4.2	One-Step Formation of Semiconducting and Insulating Layers in OTFTs	198
7.4.3	Improved Environmental Stability	201
7.4.4	Patterned Domains of Polymer Blends	201
7.4.5	Improved Charge Carrier Mobility	204
7.4.6	Crystallization-Induced Vertical Phase Segregation	206
7.5	Blend Films with Embedded P3HT Nanowires	207
7.5.1	P3AT Nanowires	208
7.5.2	Polymer Blends with Embedded P3HT Nanowires	209
7.5.3	Nanowires from Conjugated Block Copolymers	212
7.5.4	Electrospun Nanowires from Conjugated Polymer Blends	212
7.6	Conclusions and Outlook	214
	References	214
8	Semiconducting Organic Molecule/Polymer Composites for Thin-Film Transistors	219
	<i>Jeremy N. Smith, John G. Labram, and Thomas D. Anthopoulos</i>	
8.1	Introduction	219
8.1.1	OFET Device Operation	220
8.1.2	Small-Molecule/Polymer Film Morphology	222
8.2	Unipolar Films for OFETs	224
8.2.1	Oligothiophene/Polymer Blends	224
8.2.2	Acene/Polymer Blends	227

8.3	Polymer/Fullerene Ambipolar OFETs	232
8.3.1	Polymer:Fullerene Blend Morphology	233
8.3.1.1	Solvent and Polymer Molecular Weight	235
8.3.1.2	Blend Composition	236
8.3.1.3	Temperature- and Time-Dependent Annealing	238
8.3.1.4	Effect of Fullerene Molecular Weight	240
8.3.2	Polymer:Fullerene Bilayer Diffusion	241
8.3.2.1	Modeling Fullerene Diffusion	243
8.4	Conclusions	245
	References	246
9	Enhanced Electrical Conductivity of Polythiophene/Insulating Polymer Composite and Its Morphological Requirement	251
	<i>Guanghao Lu and Xiaoniu Yang</i>	
9.1	Introduction	251
9.2	Phase Evolution and Morphology	253
9.3	Enhanced Conductivity of Conjugated Polymer/Insulating Polymer Composites at Low Doping Level: Interpenetrated Three-Dimensional Interfaces	258
9.4	Conductivity of Semiconducting Polymer/Insulating Polymer Composites Doped by Molecular Dopant	260
9.5	Mechanisms for the Enhanced Conductivity/Mobility	261
9.5.1	Improved Crystallinity and Molecular Ordering	261
9.5.2	"Self-Encapsulation" Effect	262
9.5.3	Bulk 3-D Interface and Reduced Polarization of Matrix at Interface	263
9.5.4	"Zone Refinement" Effect	264
9.5.5	Reduced Polaron–Dopant Interaction	265
9.6	Perspective	267
	References	268
10	Intrinsically Conducting Polymers and Their Composites for Anticorrosion and Antistatic Applications	269
	<i>Yingping Li and Xianhong Wang</i>	
10.1	ICPs and Their Composites for Anticorrosion Application	269
10.1.1	Introduction	269
10.1.2	Protection Mechanism	270
10.1.2.1	Anodic Protection Mechanism	270
10.1.2.2	Inhibitory Protection Mechanism	274
10.1.2.3	Cathodic Protection Mechanism	274
10.1.2.4	Comprehensive Understanding on Protection Mechanism of ICPs	277
10.1.3	Matrix Resin of Conducting Composite Coating	278
10.1.4	Processing Methods	279
10.1.5	Conclusions and Perspectives	280

10.2	Antistatic Coating	282
10.2.1	Introduction	282
10.2.2	Synthesis of Processable ICPs	283
10.2.3	Processing of ICPs for Antistatic Application	284
10.2.4	Water-Based Polyaniline and Its Complex	286
10.3	Summary	288
	References	289
11	Conjugated–Insulating Block Copolymers: Synthesis, Morphology, and Electronic Properties	299
	<i>Dahlia Haynes, Mihaela C. Stefan, and Richard D. McCullough</i>	
11.1	Introduction	299
11.2	Oligo- and Polythiophene Rod–Coil Block Copolymers	300
11.3	Poly(<i>p</i> -phenylene vinylene) Block Copolymers	308
11.4	Polyfluorenes	313
11.5	Other Semiconducting Rod–Coil Systems	319
11.6	Conjugated–Insulating Rod–Rod Block Copolymers	320
11.7	Conclusions and Outlook	322
	References	322
12	Fullerene/Conjugated Polymer Composite for the State-of-the-Art Polymer Solar Cells	331
	<i>Wanli Ma</i>	
12.1	Introduction	331
12.2	Working Mechanism	332
12.2.1	Unique Properties of Organic Solar Cells	332
12.2.2	Understanding the Bulk Heterojunction Structures	332
12.2.3	Device Parameters and Theoretical Efficiency	334
12.2.3.1	Short-Circuit Current Density	335
12.2.3.2	Open-Circuit Voltage	336
12.2.3.3	Fill Factor	337
12.2.3.4	Theoretical Efficiency	338
12.3	Optimization of Fullerene/Polymer Solar Cells	338
12.3.1	Design of New Materials	339
12.3.1.1	Absorption Enhancement	340
12.3.1.2	Fine-Tuning of HOMO and LUMO Energy Levels	344
12.3.1.3	Mobility and Solubility Improvement	345
12.3.1.4	New Fullerene Derivative	345
12.3.2	Optimization of Polymer Solar Cell Devices	346
12.3.2.1	Morphology Control	346
12.3.2.2	Device Architectures	351
12.4	Outlook	354
	References	355