

## Contents

**Foreword** XIX

**List of Contributors** XXXIII

**Color Plates** XLV

### **Part I Industrial Applications**

- 1 Organic Transistors as a Basis for Printed Electronics** 3  
*Walter Fix, Andreas Ullmann, Robert Blache, and K. Schmidt*
- 1.1 Introduction 3  
1.2 What is an Organic Transistor? 4  
1.3 How Does an Organic Transistor Work and  
How Does it Distinguish Itself from a Conventional One? 5  
1.4 Basic Logical Integrated Circuits: Ring Oscillators 6  
1.5 Complex Organic Circuits: the 64-Bit RFID Tag 9  
1.6 Organic CMOS Circuits 10  
1.7 Printing Electronics 11  
1.8 Application and Future Prospects 13  
1.9 Summary and Prospects 14  
Acknowledgements 14  
References 14
- 2 Printable Electronics: Flexibility for the Future** 17  
*Mark A.M. Leenen, Heiko Thiem, Jürgen Steiger,  
and Ralf Anselmann*
- 2.1 Introduction 17  
2.2 Printed Electronics Market Forecasts 17  
2.3 New Products 18  
2.3.1 Advantages of Printed Electronics 19  
2.3.2 Passive Elements 20  
2.3.3 TFT-Backplanes 21

2.3.4	RFID Tags	21
2.4	Printing Considerations	23
2.5	Materials	24
2.5.1	Conductors	25
2.5.2	Dielectrics	27
2.5.3	Semiconductors	28
2.5.3.1	Organic Semiconductors	29
2.5.3.2	Inorganic Semiconductors	30
2.6	Creavis Science-to-Business Approach	31
2.7	Conclusion	32
	Acknowledgements	33
	References	33

## Part II Molecular Compounds

### 3 Fluorinated Phthalocyanines as Molecular Semiconductor Thin Films 37

*H. Brinkmann, C. Kelting, S. Makarov, O. Tsaryova, G. Schnurpfeil, D. Wöhrle, and D. Schlettwein*

3.1	Introduction	37
3.2	Experimental	39
3.2.1	Chemical Synthesis	39
3.2.1.1	Phthalocyaninato	39
3.2.1.2	2,29,20,2-Tetrafluorophthalocyaninato Zinc(II) (F <sub>4</sub> PcZn)	39
3.2.1.3	4,5-Difluorophthalonitrile	40
3.2.1.4	2,29,20,2-,3,39,30,3-Octafluorophthalocyaninato Zinc(II) (F <sub>8</sub> PcZn)	40
3.2.1.5	1,19,10,1-,2,29,20,2-,3,39,30,3-,4,49,40,4-Hexadecafluorophthalocyaninato Zinc(II)	40
3.2.2	Calculation of Energy Levels	40
3.2.3	Thin Film Preparation and Measurements	41
3.3	Results and Discussion	42
3.3.1	Synthesis and Molecular Characterisation	42
3.3.2	Thin Evaporated Films of Zinc(II) Phthalocyanines with a Different Degree of Fluorination	44
3.3.3	Growth of F <sub>16</sub> PcZn Thin Films	51
3.3.4	Response to Oxygen from Air	52
3.3.5	Measurements of the Field Effect	55
3.4	Conclusions	57
	Acknowledgements	58
	References	58

<b>4</b>	<b>Novel Organic Semiconductors and Processing Techniques for Organic Field-Effect Transistors</b> 61 <i>H. N. Tsao, H. J. Räder, W. Pisula, A. Rouhanipour, and K. Müllen</i>
4.1	Introduction 61
4.2	Molecular Alignment from Solution Through the Zone-Casting Technique 62
4.3	Solution Processed Donor–Acceptor Copolymer Field-Effect Transistors 67
4.4	Processing of Giant Graphene Molecules by Soft-Landing Mass Spectrometry 69
4.5	Conclusion 72 Acknowledgements 72 References 72
<b>5</b>	<b>Assembly, Structure, and Performance of an Ultra-Thin Film Organic Field-Effect Transistor (OFET) Based on Substituted Oligothiophenes</b> 75 <i>K. Haubner, E. Jaehne, H.-J. P. Adler, D. Koehler, C. Loppacher, L. M. Eng, J. Grenzer, A. Herasimovich, and S. Scheiner</i>
5.1	Introduction 75
5.2	Experimental 78
5.2.1	General Procedures 78
5.2.2	Sample Preparation 79
5.2.3	OFET Device Fabrication 80
5.3	Results and Discussion 81
5.3.1	Bulk Characterisation 81
5.3.2	Film Characterisation 85
5.3.3	OFET Performance Characteristics 89
5.4	Conclusion 92 Acknowledgements 93 References 93
<b>6</b>	<b>Organic Transistors Utilising Highly Soluble Swivel-Cruciform Oligothiophenes</b> 95 <i>Achmad Zen, Patrick Pingel, Dieter Neher, and Ullrich Scherf</i>
6.1	Introduction 95
6.2	Optical and Thermal Properties 97
6.2.1	Optical Properties 97
6.2.2	Thermal Properties 99
6.3	Morphology Studies on Layers of Substituted Xruciforms 99
6.3.1	XRD Studies 100
6.3.2	AFM Studies 102
6.4	OFET Studies 104

VIII | Contents

- 6.5 Mobilities from Radiation Induced Conductivity Measurements 107
- 6.6 Conclusions 109
- 6.7 Experimental Section 109
  - Acknowledgement 110
  - References 110

**Part III Structural and Morphological Aspects**

- 7 Chemical Approaches to the Deposition of Metal Electrodes onto Self-Assembled Monolayers – A Step Towards the Fabrication of SAM-Based Organic Field-Effect Transistors 115**  
*Heidi Thomas, Jan Müller, and A. Terfort*
  - 7.1 Introduction 115
  - 7.2 Results and Discussion 117
    - 7.2.1 Nature of the SAM 117
    - 7.2.2 Seeding Material 119
    - 7.2.3 Stabilising Layer of the Nanoparticles 120
    - 7.2.4 Amplification Method (CVD vs. ELD) 121
    - 7.2.5 Composition of the ELD Bath 125
  - 7.3 Conclusions 132
  - 7.4 Experimental 133
    - 7.4.1 Nanoparticles 133
    - 7.4.2 Substrate Preparation 133
    - 7.4.3 Plasma Cleaning [66] 133
    - 7.4.4 Stamp Preparation 133
    - 7.4.5 SAM Preparation 134
    - 7.4.6 Ellipsometry 134
    - 7.4.7  $\mu$ CP of Nanoparticles 134
    - 7.4.8 Electroless Deposition of Gold 134
    - 7.4.9 Chemical Vapour Deposition of Gold 134
    - 7.4.10 AFM Measurements 135
  - Acknowledgements 135
  - References 135
  
- 8 Growth Morphologies and Charge Carrier Mobilities of Pentacene Organic Field Effect Transistors with RF Sputtered Aluminium Oxide Gate Insulators on ITO Glass 139**  
*M. Voigt, J. Pflaum, and M. Sokolowski*
  - 8.1 Introduction 139
  - 8.2 Experimental 140
  - 8.3 Results and Discussion 142

8.3.1	Structural and Morphological Properties of the Pc Films	142
8.3.1.1	X-Ray Diffraction	142
8.3.1.2	Scanning Force Microscopy	145
8.3.2	Analysis of the Electrical Characteristics	148
8.3.2.1	Overview of the ID–VD Characteristics	148
8.3.2.2	Temperature Dependence of the Mo-bilities	151
8.3.2.3	Detailed Analysis of the Field Effect Mobilities as a Function of VD and VG	152
8.3.3	Discussion and Conclusions	157
8.3.3.1	Correlation of the Electrical Transport Properties and the Film Morphology	157
8.3.3.2	Origin of the Structural Defects and Conclusions	158
8.4	Summary	159
	Acknowledgements	159
	References	160
<b>9</b>	<b>In Situ X-Ray Scattering Studies of OFET Interfaces</b>	<b>161</b>
	<i>Alexander Gerlach, Stefan Sellner, Stefan Kowarik, and Frank Schreiber</i>	
9.1	Introduction	161
9.2	X-Ray Scattering	163
9.3	Growth Physics	164
9.3.1	Monolayer Deposition	164
9.3.2	Thin Film Growth and Dynamic Scaling	165
9.3.3	Growth of Organic Molecular Materials	166
9.4	Organic Thin Films	167
9.4.1	Pentacene on Silicon Oxide	167
9.4.2	DIP on Silicon Oxide	169
9.4.3	PTCDA on Ag(111), Cu(111), and Au(111)	173
9.5	Organic Heterostructures	175
9.5.1	Metal Capping Layers	175
9.5.2	Insulating Capping Layers	176
9.5.2.1	Degradation of Devices	177
9.5.2.2	Encapsulation of Devices	177
9.5.2.3	Aluminium Oxide Capping Layers	178
9.5.2.4	Thermal Stability of Capped Organic Films	180
9.6	Conclusion	183
	Acknowledgements	184
	References	184

<b>10</b>	<b>X-Ray Structural and Crystallinity Studies of Low and High Molecular Weight Poly(3-hexylthiophene)</b> 189 <i>S. Joshi, S. Grigorian, and U. Pietsch</i>
10.1	Introduction 189
10.2	Sample Preparation 191
10.3	X-Ray Grazing-Incidence Diffraction Studies 191
10.4	Structure Determination for LMW Fraction 195
10.5	Temperature-Dependent Measurements 198
10.6	Discussion 202
	Acknowledgements 204
	References 204
<b>11</b>	<b>Molecular Beam Deposition and Characterisation of Thin Organic Films on Metals for Applications in Organic Electronics</b> 207 <i>G. Witte and Ch. Wöll</i>
11.1	Introduction 207
11.2	Electronic Level Alignment at the Metal/Organics Interface 208
11.3	Structural Properties at the Metal/Organic Interface 211
11.4	General Principles Governing Organic Molecular Beam Deposition (OMBD) on Metal Substrates: Case Studies for Rubrene, Perylene and Pentacene 212
11.4.1	Rubrene Deposition on Au(111) 213
11.4.2	Adsorption-Induced Restructuring of Metal Substrates: Perylene on Cu(110) 214
11.4.3	Organic Molecular Beam Deposition of Pentacene on Clean Metal Surfaces 216
11.5	Organic Molecular Beam Deposition of Perylene 220
11.6	Growth of Other Molecules of Interest for Organic Electronics on Metal Substrates 223
11.7	Growth of Pentacene on Modified Gold Surfaces 224
11.8	Realisation of an “Ideal” Diode-like Organic Electronic Device 226
	Acknowledgement 228
	References 229
<b>12</b>	<b>Fundamental Interface Properties in OFETs: Bonding, Structure and Function of Molecular Adsorbate Layers on Solid Surfaces</b> 235 <i>S. Soubatch, R. Temirov, and F. S. Tautz</i>
12.1	Introduction 235
12.2	Bonding 238
12.2.1	Bonding: What can be Learned for OFETs? 243

12.3	Structure	246
12.3.1	Structure: What can be Learned for OFETs?	252
12.4	Function	255
12.5	Conclusion	259
	Acknowledgements	259
	References	260
<b>13</b>	<b>Metal/Organic Interface Formation Studied <i>In Situ</i> by Resonant Raman Spectroscopy</b>	<b>263</b>
	<i>G. Salvan, B.A. Paez, D.R.T. Zahn, L. Gisslen, and R. Scholz</i>	
13.1	Introduction	263
13.2	Methods	263
13.2.1	Sample Preparation and Characterisation	263
13.2.2	Theoretical Methods	264
13.3	Results and Discussion	264
13.3.1	Chemistry of Metal/Organic Interfaces	264
13.3.2	Morphological Properties and Indiffusion of Metals at the Interfaces with Organic Semiconductors	270
13.3.3	Assignment of Raman Intensities with DFT Calculations	276
13.4	Conclusion	278
	Acknowledgements	279
	References	279
<b>14</b>	<b>Development of Single-Crystal OFETs Prepared on Well-Ordered Sapphire Substrates</b>	<b>281</b>
	<i>S. Sachs, M. Paul, F. Holch, J. Pernpeintner, P. Vrdoljak, M. Casu, A. Schöll, and E. Umbach</i>	
14.1	Introduction	281
14.1.1	The Present Micro-OFET Concept	282
14.2	Experimental	283
14.3	Results and Discussion	284
14.3.1	Realisation of the Micro-OFET Concept	284
14.3.1.1	Sapphire Substrate	284
14.3.1.2	Growth of DIP on Sapphire	286
14.3.1.3	Contacts – the Au/DIP Interface	289
14.3.1.4	Gate Electrode	294
14.3.1.5	<i>In Situ</i> Device Characterisation	295
14.4	Conclusions	296
	Acknowledgements	297
	References	297

**Part IV Device Performance and Characterisation**

**15 Pentacene Devices: Molecular Structure, Charge Transport and Photo Response 301**

*Bert Nickel*

- 15.1 Introduction 301
  - 15.2 Pentacene Thin Films 301
    - 15.2.1 Film Formation on Inert Surfaces 301
    - 15.2.2 Film Formation on Metallic and Conductive Surfaces 305
    - 15.2.3 Mixed Films 306
  - 15.3 Pentacene OTFT Properties 307
    - 15.3.1 Mobility and Charge Carrier Density 307
    - 15.3.2 Influence of Trap States and Fixed Interface Charges 309
    - 15.3.3 Injection 311
  - 15.4 Photo Response 311
  - 15.5 Outlook 312
- Acknowledgements 313  
References 314

**16 Characteristics and Mechanisms of Hysteresis in Polymer Field-Effect Transistors 317**

*G. Paasch, S. Scheinert, A. Herasimovich, I. Hörselmann, and Th. Lindner*

- 16.1 Introduction 317
- 16.2 Literature Survey 318
- 16.3 Experimental Results 320
  - 16.3.1 Organic Field-Effect Transistors 320
    - 16.3.1.1 Short Channel OFET Based on P3HT 320
    - 16.3.1.2 OFET Based on a Modified PPV and with Silanised Gate Oxide 322
  - 16.3.2 Organic MIS Capacitors 323
    - 16.3.2.1 Quasi-Static *CV* Curves for a Capacitor with Arylamino-PPV 323
    - 16.3.2.2 Dynamic *CV* Curves 325
- 16.4 Trap Recharging Mechanism 327
  - 16.4.1 Simulations for the MIS Capacitor 327
  - 16.4.2 Simulations for Thin-Layer OFETs and the Corresponding Capacitor 329
- 16.5 Equilibrium of Polarons With Doubly Charged States of the Polymer Chain 331
  - 16.5.1 Polarons and Bipolarons or Polaron Pairs 332
    - 16.5.1.1 Polarons and Bipolarons 332
    - 16.5.1.2 Polarons and Polaron Pairs 333
  - 16.5.2 Polarons, Bipolarons and Polaron Pairs 335



16.5.3	Polarons and General Dipolarons	337
16.6	Bipolaron Mechanism for Hysteresis	339
16.6.1	Formation and Dissociation of Bipolarons	339
16.6.1.1	Kinetics of Formation and Dissociation	339
16.6.1.2	The Bipolaron Mechanism	340
16.6.2	Formation of Complexes With Counter Ions	341
16.6.2.1	The Kirova–Brazovskii Scenario of Complex Formation	341
16.6.2.2	Slow Ion Capture by an Overcharged Complex	342
16.7	Conclusion	343
	Acknowledgements	344
	References	344
<b>17</b>	<b>Ambipolar Charge Carrier Transport in Organic Semiconductor Blends</b>	<b>347</b>
	<i>Markus Bronner, Andreas Opitz, and Wolfgang Brütting</i>	
17.1	Introduction	347
17.2	Materials, Device Preparation and Experimental Methods	348
17.3	Unipolar Field-Effect Transistors	352
17.4	Ambipolar Field-Effect Transistors	353
17.5	Charge Carrier Mobility and Threshold Voltage	354
17.6	Film Morphology and Structure	357
17.7	Electronic Structure	359
17.8	Charge Carrier Injection	362
17.9	Ambipolar and Complementary Inverter	365
17.10	Summary	369
	Acknowledgements	369
	References	370
<b>18</b>	<b>Gate Dielectrics and Surface Passivation Layers for Organic Field Effect Transistors</b>	<b>373</b>
	<i>T. Diekmann and U. Hilleringmann</i>	
18.1	Introduction	373
18.2	Experimental	374
18.2.1	Transistor Device	374
18.2.2	Inorganic Dielectrics	374
18.2.3	Polymer Dielectrics	375
18.3	Results and Discussion	376
18.3.1	Inorganic Gate Dielectric Layers	377
18.3.1.1	Thermally Grown Silicon Dioxide	378
18.3.1.2	TEOS Oxide	380
18.3.1.3	Silicon Nitride	382
18.3.1.4	Low-Temperature Oxide: LTO	383
18.3.1.5	PECVD	384
18.3.1.6	Ta <sub>2</sub> O <sub>5</sub>	385

18.3.1.7	Conclusion	386
18.3.2	Polymer Dielectrics	387
18.3.2.1	Bectron® Varnish	389
18.3.2.2	High- <i>k</i> Resist	390
18.3.2.3	OFET on Foil Substrates	391
18.3.2.4	Conclusion	392
18.4	Degradation	393
18.5	Conclusion	398
	Acknowledgements	399
	References	399
<b>19</b>	<b>Influence of Metal Diffusion on the Electronic Properties of Pentacene and Diindenoperylene Thin Films</b>	<b>401</b>
	<i>M. Scharnberg, R. Adelung, and F. Faupel</i>	
19.1	Introduction	401
19.2	Experimental	402
19.2.1	Organic Semiconductors	402
19.2.2	Thin Film Deposition	403
19.2.3	Radiotracer Measurements	404
19.2.4	Serial Sectioning by Ion Beam Sputtering	405
19.2.5	Electrical Measurements	405
19.3	Results and Discussion	405
19.3.1	Radiotracer Measurements	405
19.3.2	Correlation Between Metal Diffusion and Device Properties of OFETs	416
19.3.3	Teflon-Based Electret Layers for Threshold Voltage Tuning	421
19.4	Conclusions	424
	Acknowledgements	425
	References	425
<b>20</b>	<b>Potentiometry on Pentacene OFETs: Charge Carrier Mobilities and Injection Barriers in Bottom and Top Contact Configurations</b>	<b>427</b>
	<i>R. Scholz, D. Lehmann, A.-D. Müller, F. Müller, and D. R. T. Zahn</i>	
20.1	Introduction	427
20.2	Device Geometries and Sample Preparation	429
20.3	Pentacene OFETs With Bottom Contacts	431
20.3.1	Potentiometry and Electrical Probes	431
20.3.2	Mobility Estimates	431
20.3.3	Two-Dimensional Device Simulation	433
20.3.4	Charge Transient Spectroscopy	436
20.4	Investigations of Top-Contacted Pentacene OFETs	438
20.4.1	Electrical Characterisation <i>In Situ</i>	438

20.4.2	Potentiometry Measurements <i>Ex Situ</i>	439
20.4.3	Charge Transient Spectroscopy	441
20.5	Conclusion	442
	Acknowledgements	443
	References	443
<b>21</b>	<b>Microscopic and Spectroscopic Characterisation of Interfaces and Dielectric Layers for OFET Devices</b>	<b>445</b>
	<i>K. Müller, Y. Burkov, D. Mandal, K. Henkel, I. Paloumpa, A. Goryachko, and D. Schmeißer</i>	
21.1	Introduction	445
21.2	Experimental	447
21.2.1	Microscopic Methods	447
21.2.1.1	PEEM	447
21.2.1.2	SKPM	448
21.2.2	Ferroelectric Devices	448
21.2.2.1	Interface Characterisation	448
21.2.2.2	Electrical Characterisation (CV, IV)	449
21.3	Results and Discussion	450
21.3.1	Microscopic Methods	450
21.3.1.1	PEEM	450
21.3.1.2	SKPM	454
21.3.2	Ferroelectric Devices	456
21.3.2.1	Interface Characterisation	456
21.3.2.2	Electrical Characterisation of MFIS Capacitors (CV Measurements)	460
21.3.2.3	Ferroelectric OFET	462
21.4	Summary and Conclusions	465
	Acknowledgements	467
	References	467
<b>22</b>	<b>Scaling Limits and MHz Operation in Thiophene-Based Field-Effect Transistors</b>	<b>469</b>
	<i>A. Hoppe, T. Balster, T. Muck, and V. Wagner</i>	
22.1	Introduction	469
22.2	Device Preparation	471
22.2.1	Geometries	471
22.2.2	Sample Preparation	472
22.3	Thiophene-Based Semiconductors	473
22.3.1	Unsubstituted Oligothiophenes	473
22.3.2	Substituted Oligothiophenes	474
22.3.3	Polythiophenes	475
22.4	<i>L</i> Dependence of OFETs	476
22.4.1	Influence of the Electrode Material	476

22.4.2	Influence of the Insulator Thickness	478
22.5	Optimised Sub-micron OFETs	479
22.5.1	Semiconductor Related Performance	479
22.5.2	Tuning the Contact Resistance	481
22.6	Influence of the Semiconductor Thickness	483
22.6.1	Large Channels	484
22.6.2	Sub-micron Channels	485
22.7	Megahertz Operation	488
22.7.1	Theoretical Considerations	488
22.7.2	Experimental Results	491
22.8	Summary	494
	Acknowledgements	495
	References	495
<b>23</b>	<b>Aluminium Oxide Film as Gate Dielectric for Organic FETs: Anodisation and Characterisation</b>	<b>499</b>
	<i>X.-D. Dang, W. Plieth, S. Richter, M. Plötner, and W.-J. Fischer</i>	
23.1	Introduction	499
23.2	Experimental	500
23.2.1	Preparation	500
23.2.2	Characterisation	500
23.3	Results and Discussion	501
23.3.1	Influence of Formation Current Density	501
23.3.2	Influence of the Formation Voltage	504
23.3.3	Influence of Anodisation Time	506
23.3.4	Influence of Surface Roughness	508
23.3.5	Barrier Aluminium Oxide Films as Gate Dielectrics for Organic Transistors	509
23.4	Conclusion	510
	Acknowledgements	511
	References	511
<b>24</b>	<b>Electronic States at the Dielectric/Semiconductor Interface in Organic Field-Effect Transistors</b>	<b>513</b>
	<i>Niels Benson, Christian Melzer, Roland Schmechel, and Heinz von Seggern</i>	
24.1	Introduction	513
24.2	Experimental	517
24.2.1	Device Structure	517
24.2.2	Device Measurement	518
24.3	Results and Discussion	519
24.4	Conclusion	535
	Acknowledgements	537
	References	537

<b>25</b>	<b>Aspects of the Charge Carrier Transport in Highly-Ordered Crystals of Polyaromatic Molecules</b>	<b>539</b>
	<i>J. Pflaum, J. Niemax, S. Meyer, and A.K. Tripathi</i>	
25.1	Introduction	539
25.2	Experimental	541
25.2.1	Material Selection	541
25.2.2	Purification	541
25.2.2.1	Purification by Zone Refinement	542
25.2.2.2	Purification by Sublimation	543
25.2.2.3	Control of Chemical Purity	543
25.2.3	Crystal Growth	544
25.2.4	Field-Effect-Transistor Fabrication	546
25.2.4.1	Gate Insulator Thickness	547
25.3	Results and Discussion	548
25.3.1	Tetracene Crystals: Surface <i>Versus</i> Bulk Transport	548
25.3.2	Diindenoperylene Crystals: Structural Impact on Transport	554
25.4	Conclusion	561
	Acknowledgements	562
	References	562
<b>Part V</b>	<b>Novel Devices</b>	
<b>26</b>	<b>Carbon Nanotube Transistors – Chemical Functionalisation and Device Characterisation</b>	<b>567</b>
	<i>Kannan Balasubramanian, Eduardo J. H. Lee, Ralf Thomas Weitz, Marko Burghard, and Klaus Kern</i>	
26.1	Introduction	567
26.2	Carbon Nanotubes – Fundamentals	568
26.2.1	Physical and Electronic Structure	568
26.2.2	Field-Effect Transistors Based on Single SWCNTs	569
26.2.3	CNT-FETs Based on Electrochemical Field-Effect	572
26.2.4	Role of Capacitances	573
26.3	Chemical Functionalisation	575
26.3.1	Motivation and Strategies	575
26.3.2	Chemically Modified Devices	576
26.3.3	Electrochemical Functionalisation	577
26.3.4	Selective Electrochemical Functionalisation	579
26.3.5	Chemical Doping	583
26.3.6	Sensors Based on Functionalised SWCNT-FETs	585
26.4	Device Characterisation of CNT-FETs	585
26.4.1	Back-Gated Devices	586
26.4.1.1	Saturation	586
26.4.1.2	Transconductance	586
26.4.1.3	Sub-Threshold Swing	586

26.4.1.4	Mobility	587
26.4.2	Electrochemically Gated Devices	587
26.4.3	Scanning Photocurrent Microscopy	587
26.5	Future Perspectives	589
26.6	Conclusion	590
	Acknowledgements	590
	References	590
<b>27</b>	<b>Contact Effects in Cu(TCNQ) Memory Devices</b>	<b>595</b>
	<i>Artur Hefczyk, Lars Beckmann, Eike Becker, Hans-Hermann Johannes, and Wolfgang Kowalsky</i>	
27.1	Introduction	595
27.2	Experimental and Results	597
27.2.1	Device Preparation	597
27.2.2	Contact Size	598
27.2.3	Oxide Interlayer Between Top Contact and Cu(TCNQ)	599
27.2.4	Reversible Loss of Bistability in Oxygen-Free Ambience	600
27.2.5	Tip Contacts of Various Metals to Cu(TCNQ)	601
27.2.6	Planar Device Structure	604
27.2.7	Localisation of Switching Region	605
27.3	Discussion and Conclusion	609
	Acknowledgements	612
	References	612
<b>28</b>	<b>Organic Field-Effect Transistors for Spin-Polarised Transport</b>	<b>613</b>
	<i>M. Michelfeit, G. Schmidt, J. Geurts, and L. W. Molenkamp</i>	
28.1	Introduction	613
28.2	Concepts and Progress of Spintronics	614
28.3	Organic Semiconductors in Spintronics Applications	616
28.4	OFET Concept for Spin-Polarised Transport	617
28.5	Experimental Realisation	620
28.6	Results and Discussion	621
28.7	Conclusion	626
	Acknowledgements	627
	References	627
<b>Index</b>		<b>629</b>