

Contents

1	Introduction	1
1.1	Research Background	1
1.2	Polymer Field-Effect Transistors	3
1.2.1	Introduction of OFET	3
1.2.2	Charge Transport Mechanism in Conjugated Polymers	6
1.2.3	Recent Development of Polymer Field-Effect Transistors	9
1.3	Research Strategy and Overview of This Thesis	14
	References	17
2	Side Chain Effects and Design of Isoindigo-Based Polymers	23
2.1	Roles of Flexible Chains in Organic Semiconductors	23
2.2	Design of Isoindigo-Based Polymers	24
2.3	Impact of Polymer Symmetry and Backbone Curvature	28
2.4	Influence of Side Chain Branching Positions	41
2.5	Conclusions	47
2.6	Experimental Details and Characterization	48
2.6.1	Device Fabrication and Characterization	48
2.6.2	Synthetic Procedures and Characterization	49
	References	54
3	Ambipolar Polymer Field-Effect Transistors Based on Functionalized Isoindigo	59
3.1	Recent Development on Ambipolar FETs	59
3.2	Fluorinated Isoindigo-Based Polymer FETs	59
3.3	Chlorinated Isoindigo for Balanced and Ambient-Stable Ambipolar Polymer FETs	65
3.4	Conclusions	72

3.5	Experimental Details and Characterization.	73
3.5.1	Device Fabrication and Characterization.	73
3.5.2	Synthetic Procedures and Characterization	74
	References	78
4	BDOPV—A Strong Electron-Deficient Building Block for Polymer Field-Effect Transistors	81
4.1	Core Extension to Buildup New Systems	81
4.2	BDPPV—The First High-Performance n-type PPV Derivative	81
4.3	BDOPV-Based Donor–Acceptor Polymer and Oxygen-Doping Effect	89
4.4	Conformation-Locked BDPPV-Based Polymers and Effect of Fluorine Substitution Positions	94
4.5	Conclusions	102
4.6	Experimental Details and Characterization.	103
4.6.1	Device Fabrication and Characterization.	103
4.6.2	Synthetic Procedures and Characterization	104
	References	109
5	Summary and Outlook	113