

TABLE OF CONTENTS

CHAPTER-1	1
Introduction	1
1.1 Thesis Abstract.....	2
1.2 Evolution of Thin Film Transistors	5
1.3 Organic Semiconductors in TFTs.....	8
1.4 Gate Dielectrics in TFTs.....	17
1.5 Schematic and Charge Transport Mechanism in TFTs.....	22
1.6 OTFTs Applications.....	28
1.7 Resources utilized in Device fabrication and Sensing characterization	36
1.8 Outlines of the Thesis	36
CHAPTER-2	39
A Novel P3HT/MoS₂ Nanocomposite-based Organic TFT for Ammonia Detection	39
2.1 Introduction.....	40
2.2 Chemical used and Material Synthesis.....	43
2.3 Device Fabrication Steps	43
2.4 Thin Film Characterization.....	45
2.5 Device Results and Sensing Mechanism.....	47
2.6 Electrical and Extracted Sensing Parameters	51
2.7 Sensing Mechanism	56
2.8 Conclusion.....	58
CHAPTER-3	59
Low-voltage TFT based Efficient Ammonia Sensor with Controlled Morphology of Sensing Film over LaZrOx high-k Dielectric Film	59
3.1 Introduction.....	60
3.2 Experimental Procedure	63
3.3 OTFT Characterization and Sensing Setup.....	65
3.4 Electrical and Sensing Characterization	68
3.5 Device Physics and Sensing Mechanism.....	75
3.6 Conclusion.....	78
CHAPTER-4	79
Enhanced Ammonia Sensing with Au doped P3HT based Low-Voltage Operated Organic TFT on Bilayer (TiO₂/HfO₂) Dielectric Film	79
4.1 Introduction.....	80
4.2 Experimental Section	83
4.3 Film Characterization and Sensing Setup	85

4.4 Electrical, Sensing Results, and Discussion	90
4.5 Conclusion.....	99
CHAPTER-5.....	101
A Flexible Low-Voltage Operated Ammonia Sensor based on Polymer/2D g-C₃N₄ Nanocomposite and Hybrid Dielectric (ZrO_x/PMMA/PMCF) Film	101
5.1 Introduction.....	102
5.2 Experimental Procedure.....	105
5.3 Thin Film Characterization and Sensing Setup	107
5.4 Device Characteristics and Sensing Results.....	109
5.5 Conclusion and Future Scope.....	120
CHAPTER-6	121
Summary and Future Scope of Research.....	121
6.1 Chapter-Wise Summary.....	123
6.2 Future Scope of Research	129
Author's Journal Publications	133
Author's Conference Publications	134
References.....	135