

Table of Contents

Chapter 01 Introduction

1.1 Supramolecular chemistry	2
1.2 Self-assembly	2
1.3 Supramolecular gel	3
1.3.1 Classification of supramolecular gel	3
1.3.2 Low molecular weight gelators	4
1.3.2.1 Urea based LMWGs	5
1.3.2.2 Amide based LMWGs	10
1.3.3 Characterization of Supramolecular gels	18
1.3.3.1 NMR Spectroscopy	18
1.3.3.2 Infrared spectroscopy	19
1.3.3.3 Ultraviolet-Visible Spectroscopy	19
1.3.3.4 Fluorescence Spectroscopy	19
1.3.3.5 Circular dichroism spectroscopy	20
1.3.3.6 Single crystal diffraction	20
1.3.3.7 Wide-angle X-ray scattering	20
1.3.3.8 Small angle X-ray scattering	21
1.3.3.9 Small angle neutron scattering	21
1.3.3.10 Scanning electron microscopy	21
1.3.3.11 Transmission electron microscopy	21
1.3.3.12 Atomic force Microscopy	22
1.3.3.13 Dynamic Light Scattering	22
1.3.3.14 Isothermal titration calorimetry	22
1.3.3.15 Differential scanning calorimetry	23
1.3.3.16 Rheology	23
1.3.4 Applications of supramolecular gel	24
1.3.4.1 Environmental remediation	24
1.3.4.2 Biomedical applications	25

1.3.4.3 Synthesis Applications	26
1.3.4.4 Surface coatings	27
1.3.4.5 Food industry	27
1.3.4.6 Energy applications	27
1.3.4.7 Optoelectronic Applications	28
1.3.4.8 Sensing applications	29
1.4 Aim and Outlines	30
References	31

Chapter 02

A new series of thiazole-based gelators and its potential application

2.1 Introduction	44
2.2 Materials and Physical measurements	45
2.2.1 Materials	45
2.2.2 NMR Spectroscopy	45
2.2.3 FT-IR Spectroscopy	45
2.2.4 Polarized optical Microscope	45
2.2.5 SEM Measurements	46
2.2.6 Hirshfeld Surface Calculations	46
2.2.7 Powder X-ray Diffraction	46
2.2.8 Single crystal X-ray Diffraction	46
2.2.9 UV-Visible Spectroscopy studies	46
2.2.10 Fluorescence study	46
2.2.11 Small angle X-ray scattering	47
2.2.12 Small angle neutron studies	47
2.3 Experimental Procedures	49
2.3.1 Gelation Studies	49
2.3.2 Absorption studies	49
2.3.3 Emission studies	49

2.3.4 Synthesis	50
2.4 Results and Discussion	52
2.4.1 Gelation studies	52
2.4.2 Morphological Studies	54
2.4.3 Infrared Studies	55
2.4.4 Single crystal X-ray diffraction	56
2.4.5 Powder X-ray diffraction studies	58
2.4.6 Small angle neutron scattering studies	62
2.4.7 Application of Tz-9 molecules as Fluoride (F⁻) anion sensor	64
2.5 Conclusions	68
References	69

Chapter 03

Synthesis, Characterization and application of uriede based thiazole derivatives

3.1 Introduction	73
3.2 Materials and Physical measurements	74
3.2.1 Materials	74
3.2.2 Rheological studies	75
3.2.3 NMR Spectroscopy	75
3.2.4 FT-IR Spectroscopy	75
3.2.5 Polarized Optical Microscopy	75
3.2.6 SEM Measurements	75
3.2.7 Powder X-ray Diffraction	75
3.2.8 UV-Visible Spectroscopy studies	76
3.2.9 Fluorescence study	76
3.2.10 SANS Studies	76
3.3 Experimental Procedures	76
3.3.1 Gelation Studies	76



3.3.2 UV-Visible titration studies	77
3.3.3 Fluorescence titration	77
3.3.4 Determination of stoichiometry	77
3.3.5 SANS Analysis	77
3.3.6 Synthesis	78
3.4 RESULTS AND DISCUSSION	81
3.4.1 Gelation studies	81
3.4.2 Infrared spectroscopy studies	85
3.4.3 Rheological studies	87
3.4.4 Morphological Studies	89
3.4.5 Powder XRD Studies	91
3.4.6 Density functional theory studies	93
3.4.7 Small-angle neutron scattering studies	95
3.4.8 Anion sensing studies	98
3.5 Conclusion	103
References	104
Supporting information	108

Chapter 04

Design, Synthesis and characterization of benzimidazole based amide and urea derivatives as Supramolecular gelators

4.1 Introduction	116
4.2 Materials and Physical measurements	118
4.2.1 Materials	118
4.2.2 Rheological studies	118
4.2.3 NMR Spectroscopy	118
4.2.4 FT-IR Spectroscopy	119
4.2.5 SEM Measurements	119



4.2.6 Powder X-ray Diffraction	118
4.2.7 UV-Visible Spectroscopy studies	119
4.2.8 Fluorescence study	119
4.2.9 SANS Studies	119
4.3 Experimental Procedures	119
4.3.1 Gelation Studies	119
4.3.2 Absorption studies	120
4.3.3 Emission studies	120
4.3.4 Job plot	120
4.3.5 SANS Analysis	121
4.3.6 Synthesis	121
4.4 Results and Discussions	124
4.4.1 Gelation studies	125
4.4.2 Solvent effect on gelation	128
4.4.3 Rheological studies	129
4.4.4 Infrared studies	132
4.4.5 Morphological studies	135
4.4.6 Powder x-ray diffraction studies	136
4.4.7 Density functional theory studies	138
4.4.8 Small angle neutron studies	140
4.4.9 Sensing Studies	143
4.5 Conclusions	149
References	150
Supporting information	153

Summary

Publications

Conferences and workshops

