## List of Figures

Figure	Title	Page
Chapte	rl	
1.1	The Scheme of Reprecipitation method	2
1.2	The Scheme of Physical vapor deposition method	3
1.3	The Scheme of Microemulsion method	3
1.4	The Scheme of Ultra-Sonication method	4
1.5	The Scheme of Microwave method	5
1.6	The Scheme of Soft Template Method	5
1.7	The Scheme of Hard Template Method	6
1.8	Schematic representation of ACQ and AIE effect respectively.	7
1.9	Fluorescence photographs of solutions or suspensions of (left) perylene ( $20\mu$ M) and (right) hexaphenylsilole (HPS; $20\mu$ M) in THF/water mixtures with different fractions of water (fw), showing typical ACQ and AIEE effects, respectively.	7
1.10	Propeller-shaped tetraphenylethene (TPE) is non-luminescent in a dilute solution but becomes emissive in aggregated state, due to the restriction of intramolecular rotation (RIR).	9
1.11	Shell like THBA is non-luminescent in a dilute solution but becomes emissive in aggregated state, due to the restriction of intramolecular vibration (RIV).	10
1.12	Jablonski diagram illustrating coupled transitions between donor emission and acceptor absorbance in fluorescence resonance energy transfer.	13
1.13	Representative examples of fluorescent chemosensors for $Zn^{2+}$ on the basis of AIEgen. (A) Possible stoichiometry of sensing $Zn^{2+}$ ions. (B) Structure of zinc-bound AIEgen, and photographs of the aqueous solutions of after and before $Zn^{2+}$ taken under UV light illumination at 365 nm.	14
Chapter III		
3.1	SEM images of <b>P</b> <sup>1</sup> microstructures, (i) sample-e, (ii) sample-f, (iii) sample-g, (iv) sample-h, (v) sample-i, (vi) sample-j.	42
3.2	Optical fluorescence microscopy images under UV excitation of (i) sample-e, (ii) sample-f, (iii) sample-g, (iv) sample-h, (v) sample-i, (vi) sample-j.	43
3.3	UV-visible absorption spectra of (i) $\mathbf{P}^1$ in THF (ii) sample-d, (iii) sample-e, (iv) sample-f, (v) sample-g, (vi) sample-h.	44
3.4	Fluorescence emission spectra of (i) $\mathbf{P}^1$ in THF, (ii) sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e. All	45

	emission spectra were taken with 336 nm excitation.	
3.5	The fluorescence decay profiles of (i) $\mathbf{P}^1$ in THF, (ii) sample-c;	10
	excitation wavelength: 336 nm, emission wavelength: 410 nm	40
	(i) Phosphorescence spectra of $\mathbf{P}^1$ hydrosol (sample-c), (ii)	
3.6	phosphorescence decay curve of $\mathbf{P}^1$ hydrosol (sample-c) at room	48
	temperature; excitation: 336 nm and emission: 493 nm.	
	Chapter IV	
	(a) UV-visible absorption spectra and (b)Fluorescence Spectra of	
4.1	$\mathbf{P}^2$ in different solvent; cyclohexane (black line), THF (red line),	56
4.1	DMF (green line). Inset: picture taken during UV light	30
	illumination to $\mathbf{P}^2$ solutions in various solvents. $\lambda_{ex} = 365$ nm.	
	Fluorescence life time of $\mathbf{P}^2$ in different solvent. Excitation: 455	
4.2	nm, Emission: 522 nm (cyclohexane),530 nm (THF),537	56
	nm(DMF).	
	(a) UV-Vis absorption spectra of $\mathbf{P}^2$ in various proportion of	
	THF-DMF mixture. (b) Fluorescence emission spectra of $\mathbf{P}^2$ in	
4.3	various proportion of THF-DMF mixture. (c) Plot of the Stokes	57
	shift of $\mathbf{P}^2$ vs. the orientation polarizability ( $\Delta f$ ) of solvent (THF-	
	DMF) mixtures.	
	(a) Concentration dependent luminescence of $\mathbf{P}^2$ in THF. The	
	concentrations from left to right are: $1.5 \times 10-5$ , $8 \times 10-4$ , $1.0 \times 10-3$	
44	and $8 \times 10-3$ M. Inset: Pictures taken during illumination of UV	58
	light (365 nm) to different concentration of $\mathbf{P}^2$ (b) Fluorescence	38
	life time of $\mathbf{P}^2$ having different concentration in THF. Excitation:	
	455 nm, Emission: 530,578,630 nm.	
4.5	UV-Vis absorbance spectra of $\mathbf{P}^2$ (3.0×10 <sup>-3</sup> M in THF) in	59
	presence of PA in THF.	
	(a) Fluorescence emission spectra of $\mathbf{P}^2$ (1.36 $\mu$ M in THF) in	
	presence of increasing concentration (0-300 $\mu$ M) of picric acid	
	(PA), $\lambda ex = 455$ nm. (b) Plot of 10/1 Vs. [PA] for P <sup>2</sup> in THF	
4.6	(Insert show Stern-Volmer curve of corresponding fluorescence	60
	quenching in presence of different amount of PA) (c) Elements and $\mathbf{p}^2$ in THE and $\mathbf{p}^2$ in means (2)	
	Fluorescence decay profiles of <b>P</b> in THF and <b>P</b> in presence $62$	
	$\mu$ M PA; $\lambda$ em = 529nm. All emission spectra were taken with	
	557 nm excitation. (a) Elucroscopic amission spectra of $\mathbf{P}^2$ (1.26µM in THE) upon	
	(a) Function of different nitro derivatives $(25.4 \times 10.5 \text{M})$ . Inset: UV	
	light illumination of $\mathbf{P}^2$ in presence of different pitro derivatives	
4.7	$\lambda_{ex} = 365 \text{ nm}$ (b) Percentage quenching of fluorescence	61
	intensity of $\mathbf{P}^2$ (1.36µM in THE) after the addition of fixed	
	concentration (35.4 $\times$ 10-5M) of various nitro-derivatives	
48	SEM images of $\mathbf{P}^2$ microstructures with SDS (i) sample-d (ii)	62
	server interest and the server of the server	04

	sample-e, (iii) sample-g, (iv) sample-h, (v) sample-i, (vi) sample-i.	
4.9	SEM images of $\mathbf{P}^2$ microstructures without SDS (i) sample-d1, (ii) sample-e1 (iii) sample-g1 (iv) sample-h1	62
4.10	Optical fluorescence microscopy images under UV illumination of $\mathbf{P}^2$ microstructures with SDS (i) sample-e, (ii) sample-g (iii) sample-h (iv) sample-i and (v) sample-j.	63
4.11	Optical fluorescence microscopic images of $\mathbf{P}^2$ microstructures without SDS under UV illumination (i) sample-e <sub>1</sub> , (ii) sample-g <sub>1</sub> and (iii) sample-h <sub>1</sub> .	64
4.12	XRD patterns of film prepared from the microcrystal of sample- $h_1$ .	64
4.13	The UV-visible absorption spectra of (i) <b>P</b> <sup>2</sup> in THF (ii) sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e, (vii) sample-f, , (viii) sample-g, , (ix) sample-h.	65
4.14	(a) Fluorescence emission spectra of (i) $\mathbf{P}^2$ in THF, (ii) sample-a <sub>1</sub> (iii) sample-b <sub>1</sub> (iv) sample-c <sub>1</sub> (v) sample-d <sub>1</sub> (vi) sample-e <sub>1</sub> . (vii) sample-f <sub>1</sub> , (viii) sample-g <sub>1</sub> , (ix) sample-h <sub>1</sub> . $\lambda$ ex = 455 nm. (b) Fluorescence emission spectra of (i) $\mathbf{P}^2$ in THF, (ii) sample-a (iii) sample-b (iv) sample-c (v) sample-d (vi) sample-e. (vii) sample- f, (viii) sample-g, (ix) sample-h. $\lambda$ ex = 455 nm (c) Fluorescence life time of $\mathbf{P}^2$ in THF and its aggregated hydrosols (sample-h1); $\lambda$ ex = 455 nm, $\lambda$ em= 615, 675 nm.	66
	Chapter V	
5.1	<sup>1</sup> H NMR spectra of $\mathbf{P}^3$ in CDCl <sub>3</sub> .	72
5.2	$^{13}$ C NMR spectra of <b>P</b> <sup>3</sup> in CDCl <sub>3</sub> .	73
5.3	FT-IR spectra of $\mathbf{P}^3$ showing sharp peak at 1586 cm <sup>-1</sup> for C=N bond, 3426 cm <sup>-1</sup> (O – H), 1637 cm <sup>-1</sup> (C = 0), 1478 cm <sup>-1</sup> (C = C), 1143 cm <sup>-1</sup> (N – N).	73
5.4	Powder XRD spectra of <b>P</b> <sup>3</sup> .	74
5.5	SEM images of <b>P</b> <sup>3</sup> microstructures prepared in presence of 4 mM SDS (i) sample-c, (ii) sample-e, (iii) sample-g, (iv) sample- h.	74
5.6	SEM images of $\mathbf{P}^3$ microstructures prepared in the absence of SDS (i) sample-c <sub>1</sub> , (ii) sample-e <sub>1</sub> , (iii) sample-h <sub>1</sub> .	75
5.7	Optical fluorescence microscopy images (under UV excitation) of <b>P</b> <sup>3</sup> microstructure prepared in presence of 4 mM SDS (i) sample-c, (ii) sample-e (iii) sample-g (iv) sample-h.	76
5.8	Optical fluorescence microscopy images (under UV excitation) of aggregated microstructures prepared in the absence of SDS (i) sample-c1, (ii) sample-e1 (iii) sample-h1.	77
5.9	UV-Vis absorption spectra of $\mathbf{P}^3$ in (i) 0% water ( $\mathbf{P}^3$ in MeOH),	77

	(ii) 20% water, (iii) 40% water, (iv) 80% water, (v) 90% water	
	and (vi) 99.9% water.	
5.10	UV-Vis spectra of 2-hydroxy-1-naphthaldehyde and 4-	79
5.10	aminoantipyrine in MeOH.	70
5.11	UV-Vis spectra of NDAP in different solvent polarity.	78
	a) UV-Vis absorption spectra of (i) <b>P</b> <sup>3</sup> in MeOH; <b>P</b> <sup>3</sup> hydrosol	
	prepared in the absence of SDS (ii) sample-a1, (iii) sample-b1,	79
	(iv) sample-c1, (v) sample-d1, (vi) sample-e1, (vii) sample-f1,	12
5.12	(viii) sample-g1, c) UV-Vis absorption spectra of $P^3$ hydrosol	
	prepared in the presence of 4 mM SDS (i) $\mathbf{P}^3$ in MeOH (ii)	
	sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi)	
	sample-e, (vii) sample-f, (viii) sample-g.	
	(a) Fluorescence emission spectra of (i) $\mathbf{P}^3$ in MeOH. $\mathbf{P}^3$	
	hydrosol prepared in the absence of SDS (ii) sample-a1, (iii)	
	sample-b1 (iv) sample-c1 (v) sample-d1 (vi) sample-e1 (vii)	
	sample-f1 (viji) sample-g1 (ix) sample-h1 (b) The Fluorescence	
	emission spectra of $\mathbf{P}^3$ hydrosol prepared in the presence of 4	
	mM SDS (i) $\mathbf{P}^3$ in MeOH (ii) sample-a (iii) sample-b (iv)	
	sample-c (v) sample-d (vi) sample-e (vii) sample-f (viii)	
5 13	sample-e, $(v)$ sample-d, $(v)$ sample-e, $(vn)$ sample-f, $(vn)$	80
5.15	sample-g, (ix) sample-ii. All emission spectra were taken with $410 \text{ pm}$ excitation. Inset Eluorescence images of $\mathbf{P}^3$ in MeOH	00
	and its aggregated hydrosol under illumination of 366 nm	
	radiation (c) Emission spectra of freshly prepared $\mathbf{P}^3$ (62 µM)	
	in $0\%$ $00.0\%$ water $\lambda$ as: 410 nm (d) Plot of relative variation	
	of DL intensity against water content (fy) in the McOLl/water	
	of PL intensity against water content (1w) in the MeOH/water mixture. Insets, Ehrensseenes images of $\mathbf{P}^3$ (0% and 00% H2O)	
	mixture. Insets: Fluorescence images of P (0% and 99% H2O)	
	under 300 nm illuminations.	
	a) Optimized structure of $\mathbf{P}$ . b) Frontier molecular orbital plots	
5 1 4	of HOMO and LUMO energy levels of $\mathbf{P}'$ calculated by using	01
3.14	DF1-B3LYP/6-31 G (d,p) level of theory as implemented on $G_{1}$	01
	Gaussian 09.	
	(a) UV-Vis spectra and (b) Eluorescence emission spectra of $\mathbf{P}^3$	
	$(a) = \sqrt{13}$ spectra and $(b)$ in presence of increasing concentration (0-	
	$50 \text{ µM}$ of PA in water $\lambda \text{ev}$ : 465 nm (c) Plot of 10/I versus [PA]	
	for $\mathbf{P}^3$ hydrosol (Inset: Linear variation of the plot in presence of	
5.15	increasing $\mathbf{PA}$ concentration) (d) Elucrosconce lifetime of $\mathbf{P}^3$	82
	hydrogol in absence and presence of <b>DA</b> () are: 500 nm and ) av	
	= 402  nm	
	- 402 mm).	
	a) Fluorescence emission spectra of $\mathbf{P}^3$ hydrosol (sample-d) in	
	presence of fixed concentration (20 uM) of different nitro-	
5.16	derivatives (PA, DNP, NP, DNT, DNBA, DNB). Inset Images	84
	of $\mathbf{P}^3$ hydrosol in presence of fixed concentration (20µM) of	
	injunction in presence of inter concentration (20µ11) of	

	different nitroaromatics (PA, DNP, NP, DNT, DNBA, DNB) under illumination of 366 nm radiation. (b) Comparison of percentage fluorescence quenching of $\mathbf{P}^3$ hydrosol (sample-d) after the addition of fixed concentration (20µM) of various nitroaromatics.		
5.17	Fluorescence Quenching of <b>P</b> <sup>3</sup> hydrosol in presence of picric acid (PA) 2,4-dinitro-phenol (DNP), 4-nitro-phenol (NP), dinitro-tolune (DNT), dinitro-benzoic acid (DNBA), dinitro- benzene (DNB).	85	
5.18	Anti-interference experiment study of $\mathbf{P}^3$ hydrosol.	86	
5.19	Photographs (under illumination of 366 nm radiation) of fluorescence quenching of $\mathbf{P}^3$ on test strips for the visual detection of small amount of PA (a) test strip without picric acid ; PA of different concentrations (b) $1 \times 10^{-2}$ M, (c) $1 \times 10^{-3}$ M, (d) $1 \times 10^{-5}$ M, and (e) $1 \times 10^{-7}$ M.	86	
5.20	Photographs (under illumination of 366 nm radiation) of $\mathbf{P}^3$ on test strips (a) test strip without picric acid (b) picric acid crystal on test strip and (c) upon removal of picric acid crystals after 5 s.	86	
	Chapter VI		
6.1	SEM images of particles prepared in presence of 4mM SDS (a) sample-a <sub>1</sub> , (b) sample-f <sub>1</sub> .	93	
6.2	Optical fluorescence microscopy images under UV excitation of particles prepared in presence of 4mM SDS (a) sample- $a_1$ , (b) sample- $f_1$ .	93	
6.3	(a)The UV-Vis absorption spectra of (i) $\mathbf{P}^4$ in THF (ii) sample- a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e, (vii) sample-f, (b) UV–Vis absorption spectra of $\mathbf{P}^4$ in (i) 0% water ( $\mathbf{P}^4$ in THF), (ii) 20% water, (iii) 40% water, (iv) 80% water, (v) 90% water and (vi) 99.9% water.	94	
6.4	(a)The Fluorescence emission spectra of (i) $\mathbf{P}^4$ in THF (ii) sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e, (vii) sample-f, $\lambda ex$ : 315 nm. Inset Fluorescence images of $\mathbf{P}^4$ ( $\mathbf{P}^4$ in THF and aggregated hydrosol) under 365 nm UV light illumination. (b) Emission spectra of freshly prepared $\mathbf{P}^4$ (62 µM) in 0% -99.9% water. $\lambda ex$ : 315 nm. c) Plot of relative variation of PL intensity Vs. Volm percentage of water in the THF/water mixture. Insets: Fluorescence images of $\mathbf{P}^4$ (0% and 90% H <sub>2</sub> O) under 365 nm illuminations.	95	
6.5	Fluorescence anisotropy of $\mathbf{P}^4$ in the absence and presence H <sub>2</sub> O (9:1, v/v) solution [ $\mathbf{P}^4$ in THF] = 8 $\mu$ M, [sample-e] = 90 $\mu$ M, $\lambda_{ex}$ = 315 nm.	97	

	(a) UV-Vis absorption spectra of $\mathbf{P}^4$ hydrosol (38.4µM) in the	
	THF/water mixture $(10 \cdot 90 \text{ v/v})$ at different pH values of the	
	medium (pH ~ 10–12.0) (b) PL spectra of $\mathbf{P}^4$ hydrosol (38.4	
	$\mu$ M) in the THE/water mixture (10: 90 y/y) at different nH	
	values of the medium $(nH \rightarrow 10, 120)$ dev: 300 nm (c)	
	Values of the medium (pff $\sim$ 1.0–12.0). Kex. 500 mm. (c) Retionatria calibration curve of I $/$ (ratio of fluorescence)	
	Rationieutic canoration curve of $1_{345}/1_{397}$ (fatto of fuorescence	00
6.6	intensity at 345 nm to that of at 39/ nm) as a function of pH of	99
	the medium and pH dependent color shift from blue to sky with	
	decreasing concentration of H+ ions in the medium under 366	
	nm illumination. (d) Time resolved fluorescence decay curve of	
	$\mathbf{P}^4$ hydrosol (90 $\mu$ M $\mathbf{P}^4$ ) in presence of acid medium (pH ~ 4) at	
	( $\lambda$ em: 397 nm) and basic medium (pH ~ 10). $\lambda$ em =346 nm; All	
	spectra are taken using $\lambda em = 291$ nm.	
<i>(</i> <b>-</b>	Photographic picture of $\mathbf{P}^4$ and protonated $\mathbf{P}^4$ hydrosol under	100
6.7	normal light and UV light (365 nm) irradiation.	100
	(a) Normalized UV-Vis spectra and (b) Normalized PL spectra	
	of aggregated $\mathbf{P}^4$ by changing the pH of the medium from basic	
6.8	to acidic (c) Reversible switching of the emission wavelength of	101
	$\mathbf{P}^4$ by repeated addition of acid and alkali to the medium	
	Theoretically calculated frontier orbital of $\mathbf{P}^4$ and $\mathbf{P}^4$ lie using the	
	DET P2I VD/6 21C (d p) loval of theory. The optimized	
()	DFT B5L1F/0-510 (d, p) level of meory. The optimized	102 102
6.9	geometry, dipole moment and dinedral angle of P and P H+	102-103
	molecules are calculated using the TDDFT B3LYP/6-31G (d, p)	
	level of theory.	
	(a) UV-Vis spectra and (b) Fluorescence spectra of $\mathbf{P}^{\mathbf{r}}$ hydrosol	
	(90 $\mu$ M P <sup>4</sup> ) upon gradual addition of TNP (0-30 $\mu$ M). $\lambda$ ex: 315	
	nm. (c) Plot of $I_0$ /I versus concentration of TNP [TNP], added to	
6.10	$\mathbf{P}^4$ hydrosol. Inset: Stern-Volmer curve with Error Bars of	105
	fluorescence quenching in presence of different amount of TNP	102-103
	(d) Time resolved fluorescence decay curve of $\mathbf{P}^4$ hydrosol in	
	absence and presence of TNP. λex: 291 nm & λem: 346 nm.	
	a) Fluorescence emission spectra of $\mathbf{P}^4$ hydrosol (90 $\mu$ M) in	
	presence of a fixed concentration (14.3µM) of different nitro-	
6.11	derivatives. (b) Bar diagram of fluorescence intensity of $\mathbf{P}^4$	106
	hydrosol (90 µM) after the addition of fixed concentration	
	$(14.3 \mu M)$ of various nitro-aromatics.	
6.12	Anti-interference experiment study of $\mathbf{P}^4$ hydrosol	106
	Fluorescence Quenching of $\mathbf{P}^4$ hydrosol in presence of (a) 4-	100
	Nitro-phenol (NP) (b) 24-dinitro-phenol (DNP) (c) 4-	
6.13	Nitroanilina (NA) (d) Dinitro taluna (DNT) (a) Dinitro	107
	bonzono (DNP)	
(14		107
6.14	Comparison of Stern-Volmer plot of different nitroaromatics.	107

Chapter VII		
7.1	<sup>1</sup> H-NMR spectra of $\mathbf{P}^5$ in CDCl <sub>3</sub> .	115
7.2	<sup>13</sup> C-NMR spectra of $\mathbf{P}^5$ in CDCl <sub>3</sub>	115
7.3	FT-IR of chemosensor <b>P</b> <sup>5</sup> .	116
7.4	Optical fluorescence microscopy images (under UV excitation) of OVAP microstructure prepared in presence of 4 mM SDS (a) sample-e, (b) sample-f (c) sample-g.	116
7.5	UV-Vis spectra of O-Vanillin (OV) and 4-aminoantipyrine (AP) in EtOH.	117
7.6	UV-Vis absorption spectra of (a) OVAP with increasing PH (b) o-vaniline (OV) in the absence and presence of base ( $PH = 10$ ).	118
7.7	UV-Vis absorption spectra of OVAP in (i) 0% water (OVAP in EtOH), (ii) 20% water, (iii) 40% water, (iii) 60% water, (iv) 80% water, (v) 90% water and (vi) 99% water.	118
7.8	The UV-Vis absorption spectra of (i) OVAP in EtOH (ii) sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e, (vii) sample-f.	119
7.9	(a) Fluorescence emission spectra of (i) OVAP in EtOH, OVAP hydrosol prepared in the presence of 4 mM SDS (ii) sample-a, (iii) sample-b, (iv) sample-c, (v) sample-d, (vi) sample-e, (vii) sample-f, (viii) sample-g, (b) The Fluorescence emission spectra of OVAP hydrosol prepared in the absence of SDS (i) OVAP in EtOH (ii) sample-a1, (iii) sample-b1, (iv) sample-c1, (v) sample-d1, (vi) sample-e1, (vii) sample-f1, (viii) sample-g1. All emission spectra were taken with 360 nm excitation. Inset Fluorescence images of OVAP in EtOH and its aggregated hydrosol under illumination of 366 nm radiation. (c) Emission spectra of freshly prepared OVAP (62 $\mu$ M) in 0% -99.9% water. $\lambda$ ex: 360 nm. (d) Plot of relative variation of PL intensity against water content (fw) in the EtOH/water mixture. Insets: Fluorescence images of OVAP (0% and 99% H2O) under 366 nm illuminations.	119
7.10	a) Optimized structure of OVAP. b) Frontier molecular orbital plots of HOMO and LUMO energy levels of OVAP calculated by using DFT-B3LYP/6-31 G (d,p) level of theory as implemented on Gaussian 09.	120
7.11	Solid state emission of OVAP, (Ex-360 nm).	121
7.12	(a) Time-resolved fluorescence spectra of OVAP (0% water; red), OVAP (99% water; blue) and Lamp (black).(b) Time resolved fluorescence spectra of OVAP (47 $\mu$ M) and different metal of Al3+ and Zn2+ in EtOH respectively. Lamp (black), OVAP in EtOH (red), 1: 1 equiv Al3+ (blue), 1:1 equiv Zn2+	122

	(pink), ( $\lambda ex = 372$ nm, $\lambda em = 520$ nm for Al3+ and 535 nm for Zn2+).	
7.13	Particle size distribution of OVAP (47 $\mu$ M) in mixed aqueous media of 99% water content determined by DLS measurements.	123
7.14	Changes in absorption spectra of OVAP ( $47\mu$ M) with (a) the incremental addition of Al3+. Inset: colour change upon the addition of Al3+ and Zn2+ to OVAP, (b) the incremental addition of Zn+2.	123
7.15	Job's plot of OVAP according to the method for continuous variations, indicating the 1:1 stoichiometry for (a) OVAP-Al3+ (b) OVAP-Zn2+.	124
7.16	(a) Changes in emission spectra of OVAP ( $47\mu$ M) (a) with the incremental addition of Al3+. [Inset: intensity at 520 nm vs. [Al3+] plot, visible colour change upon the addition of Al3+to OVAP under UV lamp] ( $\lambda$ ex = 360 nm). (b) With incremental addition of Zn2+, [Inset: intensity at 535 nm vs. [Zn2+] plot, visible colour change upon the addition of Zn2+ to OVAP under UV lamp].	125
7.17	Fluorescence emission spectra of OVAP (60 mM) in presence of (a) 20 mM each of $Al^{3+}$ & $Zn^{2+}$ , (b) 40 mM each of $Al^{3+}$ & $Zn^{2+}$ .	125
7.18	Time resolved fluorescence spectra of OVAP (47 $\mu$ M) in EtOH and OVAP with Al <sup>3+</sup> & Zn <sup>2+</sup> respectively. Lamp (black), OVAP in EtOH (red), 1: 1 equiv OVAP & Al <sup>3+</sup> (blue); 1:1 equiv OVAP & Zn <sup>2+</sup> (pink); ( $\lambda_{ex} = 372 \text{ nm}, \lambda_{em} = 520 \text{ nm}$ for Al <sup>3+</sup> & OVAP and 535 nm for Zn <sup>2+</sup> & OVAP).	126
7.19	a) UV–Vis absorption spectra of antipyrine chemosensor OVAP $(47\mu M)$ in the absences and presence of different metal ions $(45\mu M)$ at 25°C. b) Fluorescence emission spectra of OVAP $(47\mu M)$ in Ethanol in the presence of different metal ions $(45\mu M)$ such as Na <sup>+</sup> , K <sup>+</sup> , Ag <sup>+</sup> , Mg <sup>2+</sup> , Ca <sup>2+</sup> , Co <sup>2+</sup> , Ni <sup>2+</sup> , Cu <sup>2+</sup> , Cd <sup>2+</sup> , Zn <sup>2+</sup> , Pb <sup>2+</sup> , Hg <sup>2+</sup> , Cr <sup>3+</sup> , Fe <sup>3+</sup> , Al <sup>3+</sup> and Mn <sup>2+</sup> . Excitation wavelength was at 360 nm.	127
7.20	Selectivity of OVAP for Al3+ ions in the presence of other competitive metal ions, excitation wavelength and emission maximum are 360 nm and 520 nm, respectively. Orange bars represent fluorescent intensity after the addition of the appropriate metal ion in a 47 $\mu$ M solution of OVAP. Light green bars represent the subsequent addition of same equiv. of Al3+ions in each of the samples.	127
7.21	Selectivity of OVAP for Zn2+ions in the presence of other competitive metal ions, excitation wavelength and emission maximum are 360 nm and 535 nm, respectively. Violet bars represent fluorescent intensity after the addition of the	128

	appropriate metal ion in a 47 µM solution of OVAP. Green bars	
	represent the subsequent addition of same equiv. of Zn2+ions in	
	each of the samples.	
	Selectivity of OVAP for Al3+, Zn2+ ions in the presence of	
7.00	other competitive metal ions, excitation wavelength 360 nm and	
7.22	emission maximum 520 nm for Al3+ and 535 nm for Zn2+	128
	respectively.	
	Visual color change observed with addition of different metal	
7.23	ions to OVAP as seen under daylight (upper) and UV light	129
	(lower) ( $\lambda = 365$ nm).	
	(a) The plot of absorbance of OVAP-Al3+ complex at 405 nm	
7.04	with increasing concentration of Al3+ (b) The plot of absorbance	120
7.24	of OVAP-Zn2+ complex at 425 nm with increasing	130
	concentration of Zn2+.	
	(a) The plot of normalized emission intensity of OVAP-Al3+	
	complex at 520 nm with increasing concentration of Al3+ (b)	
7.25	The plot of normalized emission intensity of OVAP-Zn2+	130
	complex at 520 nm with increasing concentration of Zn2+.	150
	a) Fluorescence intensity versus OVAP concentration plot for	
	measuring standard deviation; b) Fluorescence intensity versus	
	Al3+ concentration plot for measuring slope; the detection limit	
7.26	$[LOD (Al3+) = (3 \times 0.12791)/3.64097 \times 108 M = 1.05 \times 10-9]$	131
	M] c) Fluorescence intensity versus Zn2+ concentration plot for	
	measuring slope; the detection limit [LOD (Zn2+) = $(3 x)$	
	0.12791)/1.63353 x 108 M = 2.35 x 10-9 M].	
7 27	Photographic fluorescence images of OVAP, OVAP+Al3+, &	131
1.21	OVAP+Zn2+ under UV light illumination at 365 nm.	101
7.28	1H NMR (400 MHz) spectra of probe OVAP with Al3+ (0.0–1.0	132
	eq.) in DMSO-d6.	_
7.29	1H NMR (400 MHz) spectra of probe OVAP with Zn2+ (0.0-	133
	1.0 eq.) in DMSO-d6.	
7.30	The optimized geometry of OVAP and its corresponding AI3+,	134
	Zn2+ complexes along with their HOMO-LUMO energy gap.	
7.31	(a) Fluorescence spectra of OVAP (4/ $\mu$ M) in the presence of	
	Al3+ before and after the treatment with excess ED1A ( $\lambda ex = 260$ ) (1) El	
	300 nm), (b) Fluorescence spectra of OVAP (4/ $\mu$ M) in the	134
	presence of $Zn2+$ before and after the treatment with excess	
	EDIA ( $\lambda ex = 360$ nm), (c) Truth table of logic gate, (d) General	
	representation of an INHIBIT logic gate circuit.	