Supplementary Materials

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Development of selective and sensitive Ga^{3+}sensor for environmental safety: A comparative study between cyclohexane and aromatic bis-sulphonamides fabricated glassy carbon electrodes

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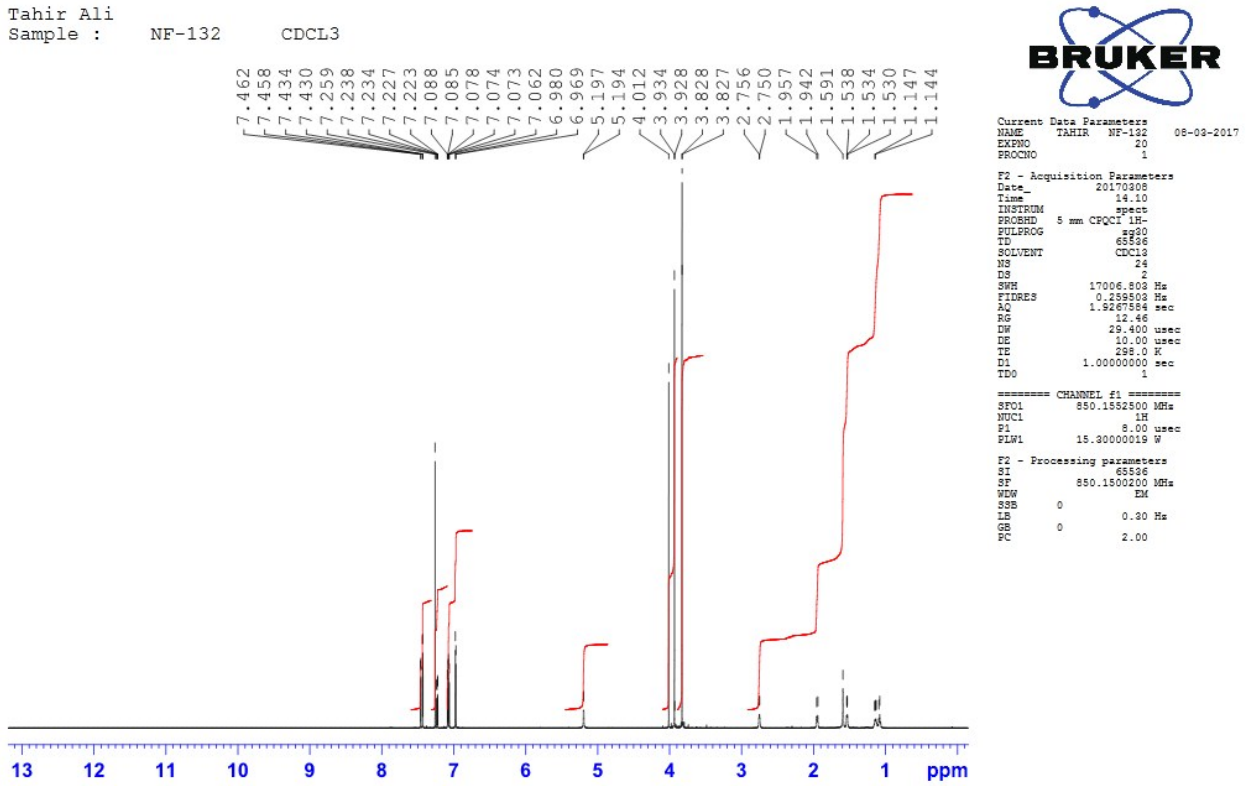

Fig. S1: ^{1}H-NMR of Molecule 3a

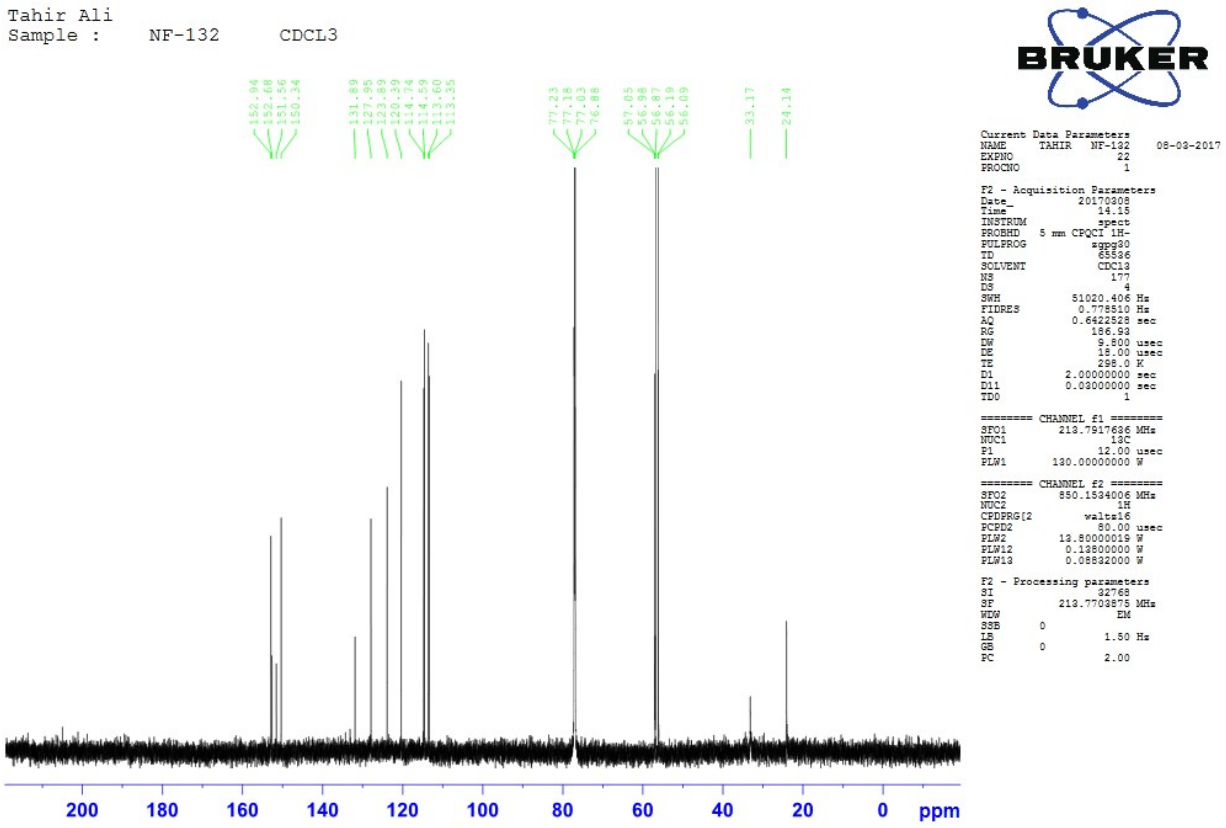

Fig. S2: ^{13}C-NMRof Molecule 3a

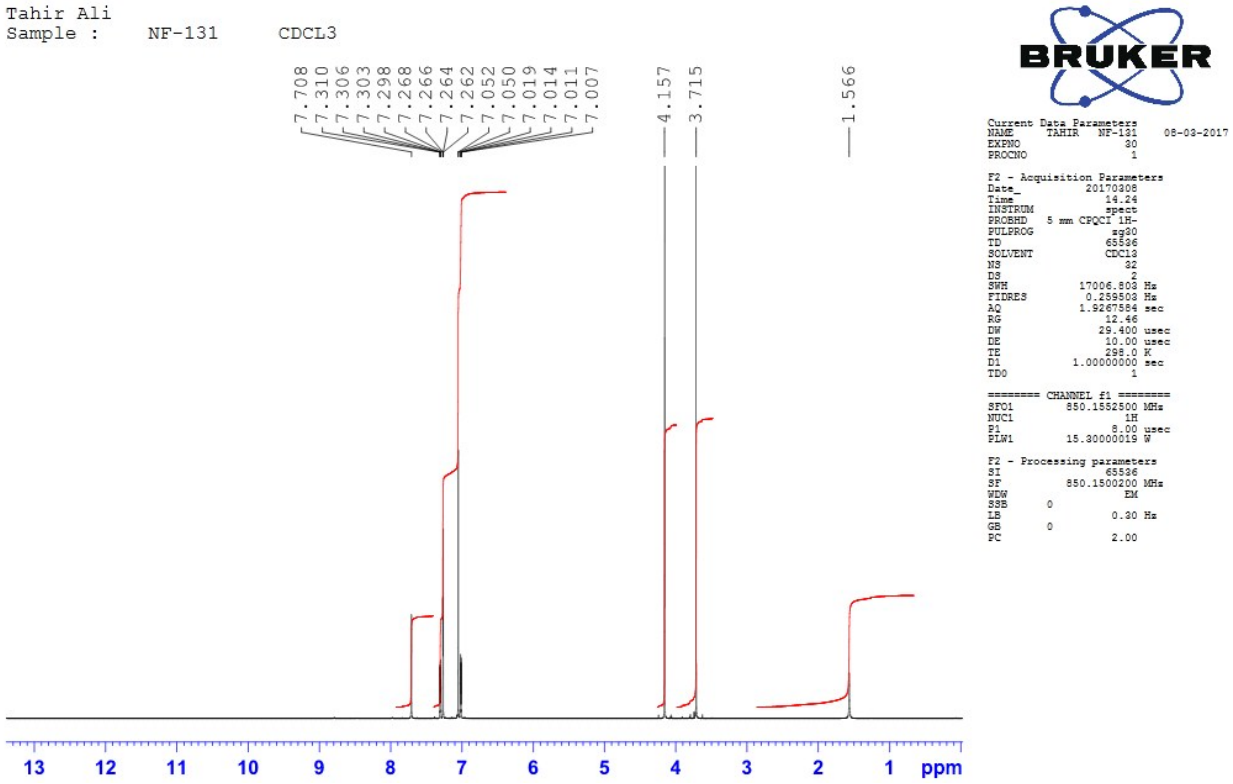

Fig. S3: ^{1}HNMR of Molecule 3b

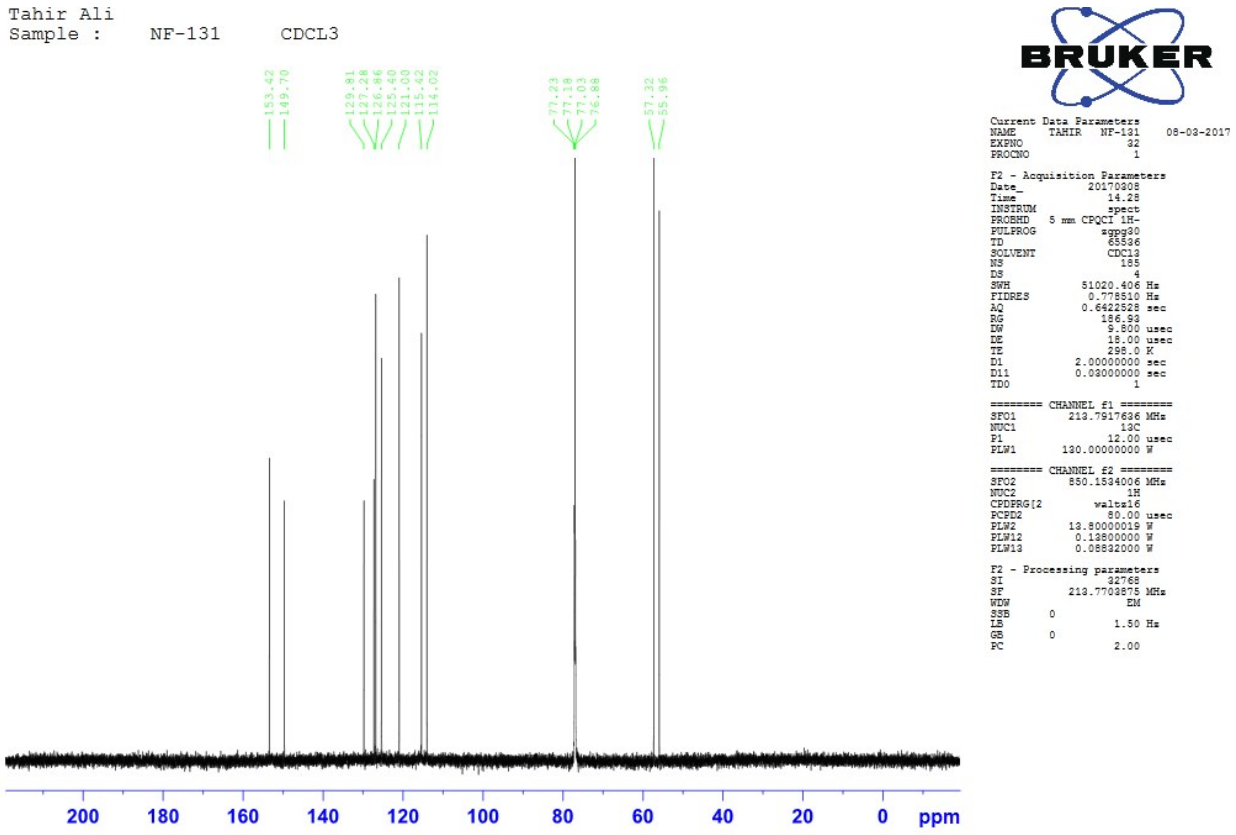

Fig. S4: ^{13}CNMRof Molecule 3b

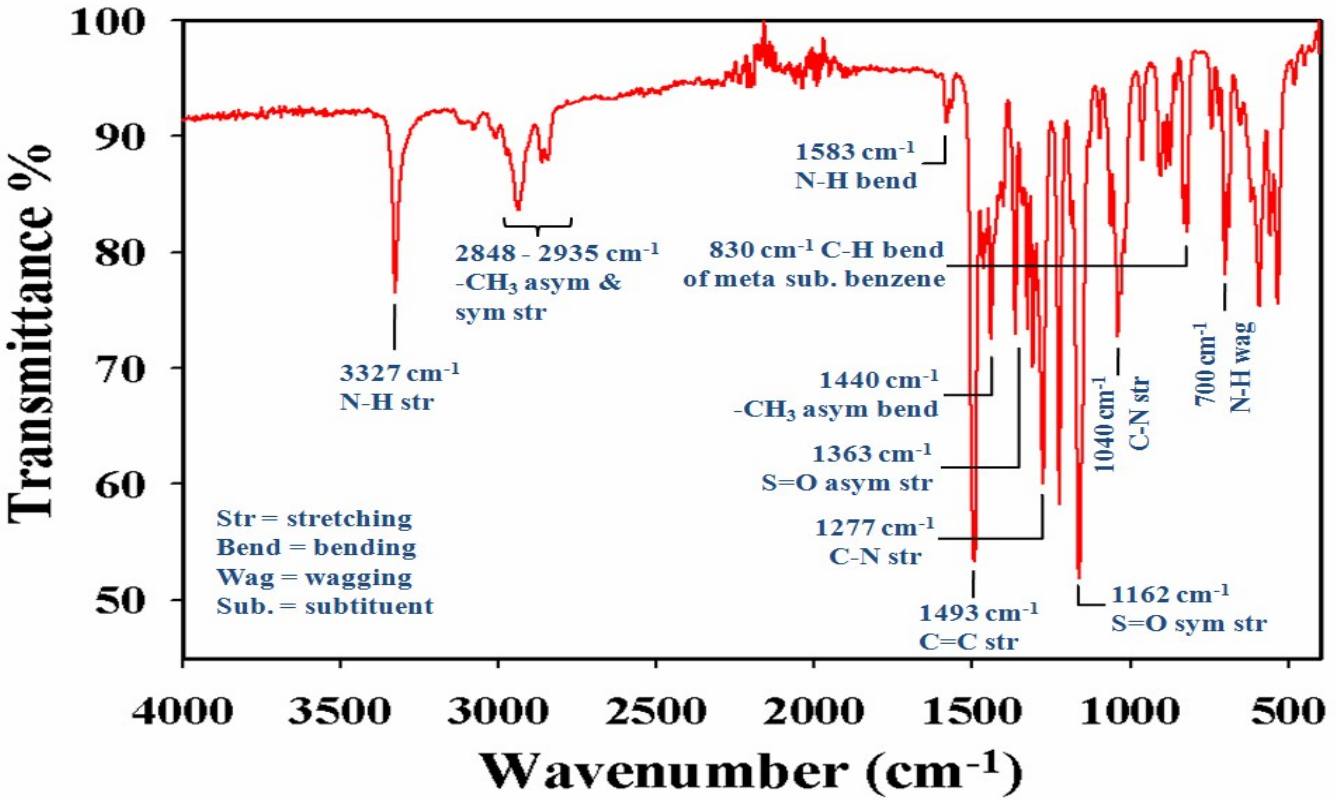

Fig. S5: IR spectrum of 3a

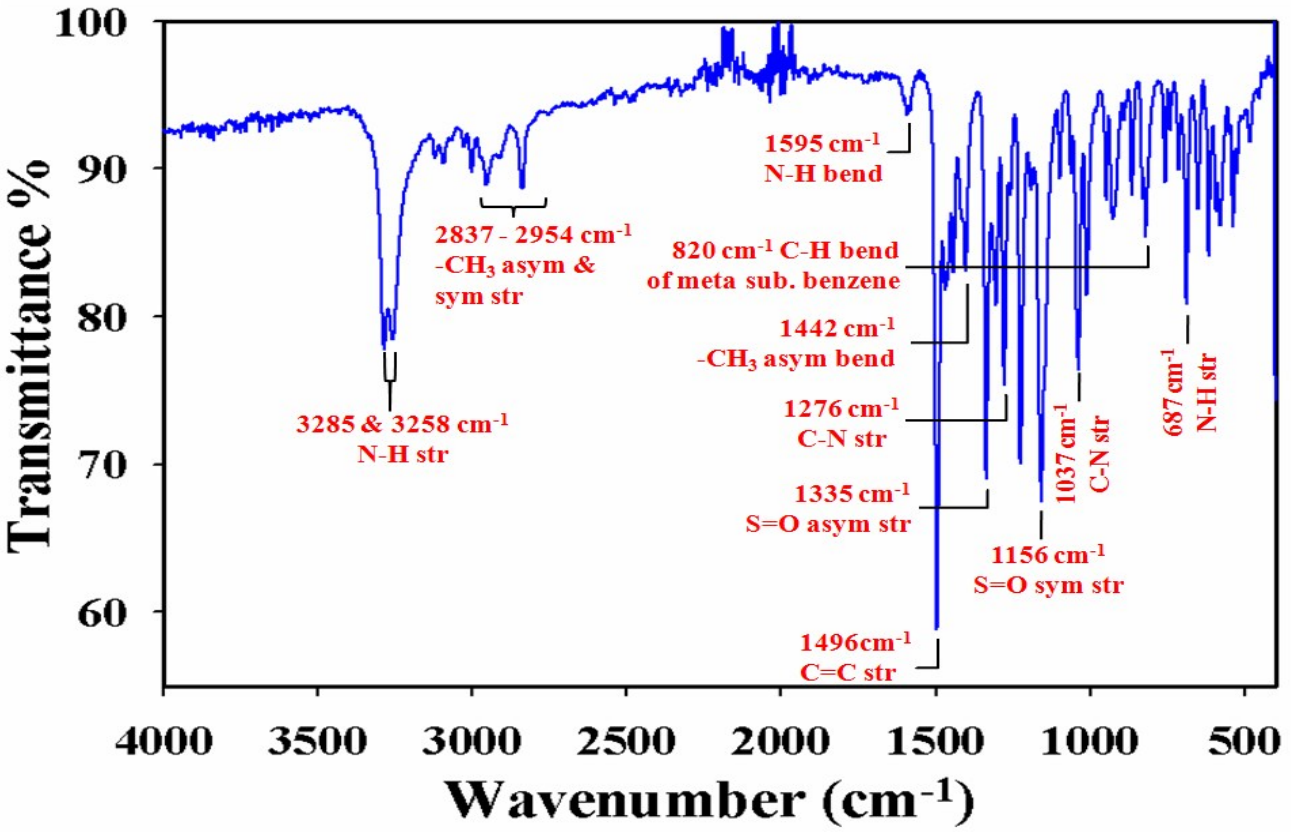

Fig. S6: IR spectrum of 3b

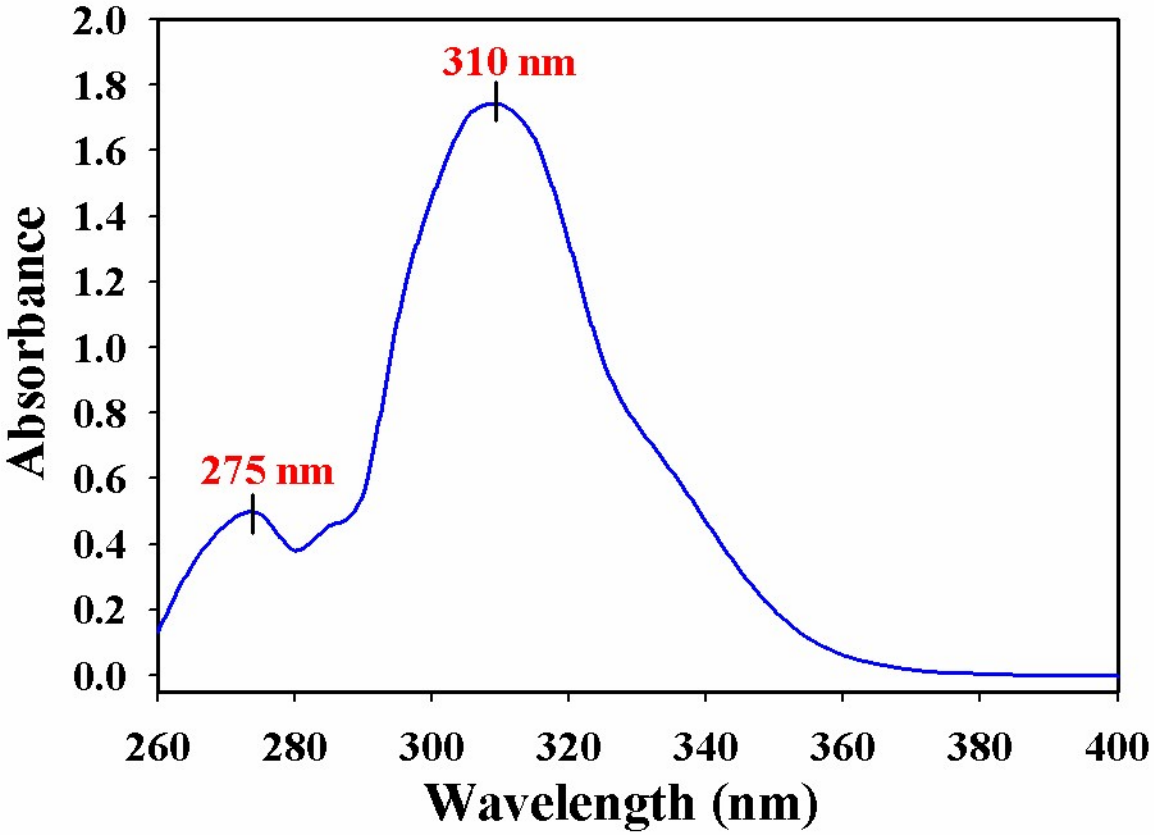

Fig. S7: UV-Vis spectrum of 3a

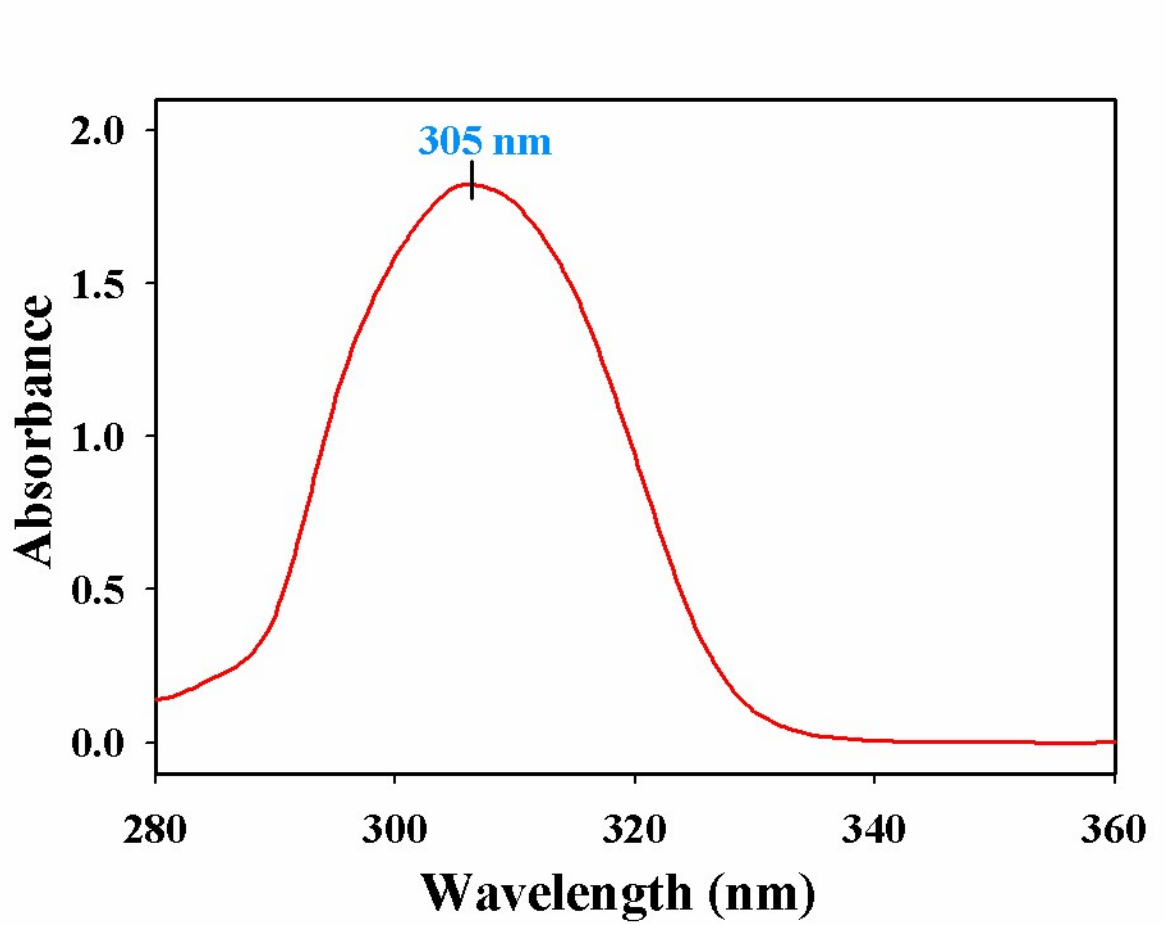

Fig. S8: UV-Vis spectrum of 3b

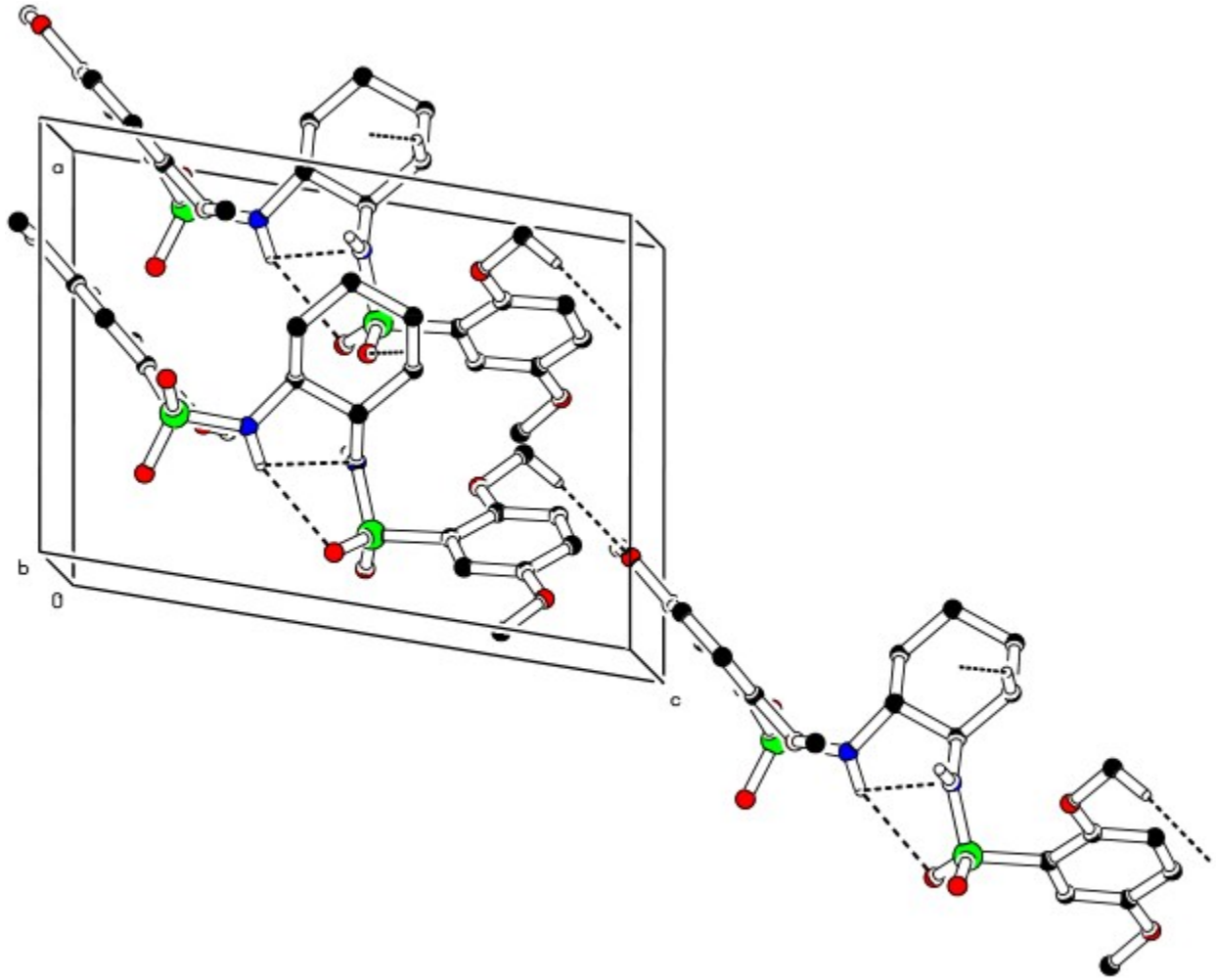

Figure S9: Unit cell view of 3a, showing hydrogen bonding using dashed lines, hydrogen atoms have been omitted for clarity.

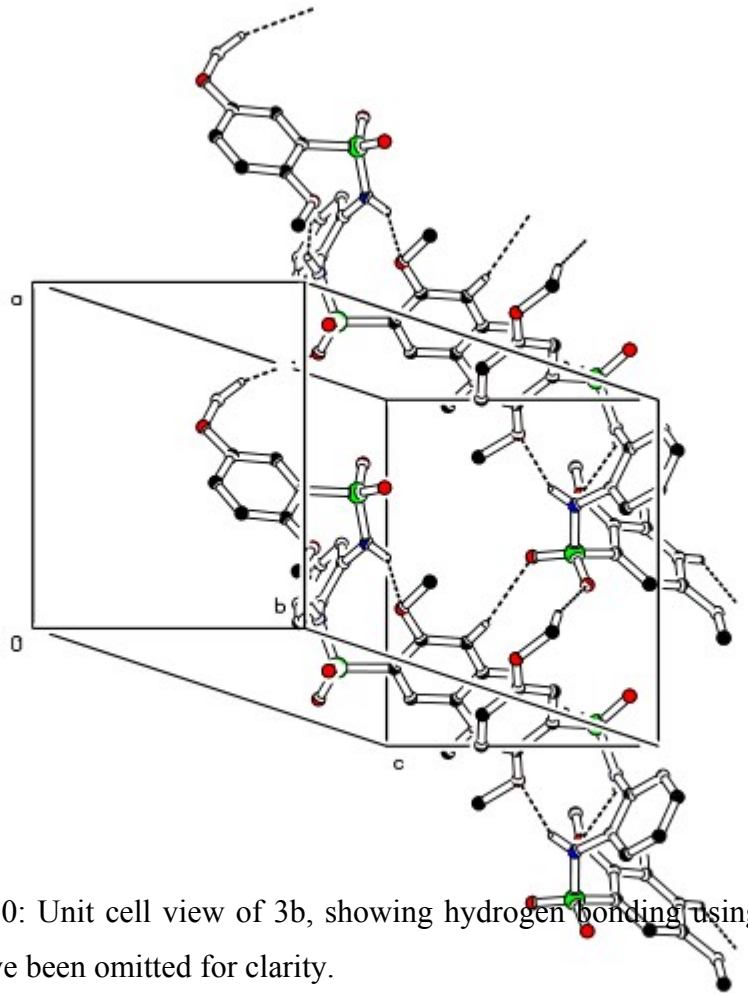

Figure S10: Unit cell view of 3b, showing hydrogen bonding using dashed lines, hydrogen atoms have been omitted for clarity.

Table S1: Selected bond lengths for Molecule **3a and 3b**

Molecule 3a					
Atom	**Atom**	**Length/Å**	**Atom**	**Atom**	**Length/Å**
C1	C2	1.376(5)	C13	C18	1.385(4)
C1	C6	1.398(4)	C13	S2	1.767(3)
C1	S1	1.771(3)	C14	C15	1.384(4)
C2	C3	1.389(5)	C14	O7	1.358(4)
C2	O3	1.367(4)	C15	C16	1.376(5)
C3	C4	1.364(5)	C16	C17	1.384(5)
C4	C5	1.386(5)	C17	C18	1.376(4)
C5	C6	1.381(5)	C17	O8	1.371(4)
C5	O4	1.377(4)	C19	O3	1.436(4)
C7	C8	1.515(4)	C20	O4	1.417(5)
C7	C12	1.534(4)	C21	O7	1.409(4)
C7	N1	1.469(4)	C22	O8	1.398(4)
C8	C9	1.518(4)	N1	S1	1.612(2)
C9	C10	1.516(4)	N2	S2	1.624(3)

C10	C11	1.511(4)	O1	S1	1.439(2)
C11	C12	1.530(4)	O2	S1	1.428(3)
C12	N2	1.474(4)	O5	S2	1.431(2)
C13	C14	1.395(4)	O6	S2	1.433(2)
C1	C2	1.376(5)	C13	C18	1.385(4)
Molecule 3b					
Atom	**Atom**	**Length/Å**	**Atom**	**Atom**	**Length/Å**
C1	C2	1.391(3)	C13	C18	1.399(4)
C1	C6	1.392(4)	C13	S21	1.765(2)
C1	S7	1.765(2)	C14	C15	1.395(4)
C2	C3	1.388(3)	C14	O7	1.373(3)
C2	O3	1.367(3)	C15	C16	1.374(4)
C3	C4	1.373(4)	C16	C17	1.382(4)
C4	C5	1.381(4)	C17	C18	1.388(4)
C5	C6	1.386(4)	C17	O8	1.370(3)
C5	O4	1.363(4)	C19	O3	1.439(3)
C7	C8	1.390(4)	C20	O4	1.398(4)
C7	C12	1.395(4)	C21	O7	1.432(3)
C7	N1	1.423(4)	C22	O8	1.415(4)
C8	C9	1.374(5)	N1	S7	1.634(2)
C9	C10	1.371(5)	N2	S21	1.625(2)
C10	C11	1.374(5)	O1	S7	1.429(2)
C11	C12	1.388(4)	O2	S7	1.427(2)
C12	N2	1.424(3)	O5	S21	1.429(2)
C13	C14	1.387(4)	O6	S21	1.426(2)

Table S2: Bond Angles for Molecules 3a and 3b

Molecule 3a							
Atom	**Atom**	**Atom**	**Angle/°**	**Atom**	**Atom**	**Atom**	**Angle/°**
C2	C1	C6	122.0(3)	O7	C14	C13	116.8(3)
C2	C1	S1	121.5(3)	O7	C14	C15	125.4(3)
C6	C1	S1	116.4(3)	C16	C15	C14	120.4(3)
C1	C2	C3	118.0(3)	C15	C16	C17	121.2(3)
O3	C2	C1	117.8(3)	C18	C17	C16	119.3(3)
O3	C2	C3	124.2(4)	O8	C17	C16	115.7(3)
C4	C3	C2	120.8(4)	O8	C17	C18	125.0(3)
C3	C4	C5	121.0(4)	C17	C18	C13	119.4(3)
C6	C5	C4	119.6(3)	C7	N1	S1	125.36(19)
O4	C5	C4	116.6(4)	C12	N2	S2	120.9(2)

O4	C5	C6	123.8(4)	C2	O3	C19	118.7(3)
C5	C6	C1	118.6(4)	C5	O4	C20	118.5(3)
C8	C7	C12	111.2(3)	C14	O7	C21	117.9(2)
N1	C7	C8	113.1(3)	C17	O8	C22	119.3(3)
N1	C7	C12	106.0(2)	N1	S1	C1	108.99(14)
C7	C8	C9	111.1(3)	O1	S1	C1	107.06(15)
C10	C9	C8	111.3(3)	O1	S1	N1	105.20(14)
C11	C10	C9	111.3(3)	O2	S1	C1	106.99(15)
C10	C11	C12	112.0(3)	O2	S1	N1	109.35(15)
C11	C12	C7	112.0(3)	O2	S1	O1	118.96(16)
N2	C12	C7	109.9(2)	N2	S2	C13	107.22(13)
N2	C12	C11	111.2(3)	O5	S2	C13	108.92(14)
C14	C13	S2	119.8(2)	O5	S2	N2	106.68(15)
C18	C13	C14	121.8(3)	O5	S2	O6	119.05(15)
C18	C13	S2	118.4(2)	O6	S2	C13	106.85(15)
C15	C14	C13	117.8(3)	O6	S2	N2	107.59(13)
Molecule 3b							
Atom	**Atom**	**Atom**	**Angle/°**	**Atom**	**Atom**	**Atom**	**Angle/°**
C2	C1	C6	121.1(2)	O7	C14	C13	117.3(2)
C2	C1	S7	121.0(2)	O7	C14	C15	124.1(2)
C6	C1	S7	117.89(19)	C16	C15	C14	120.0(3)
C3	C2	C1	118.3(3)	C15	C16	C17	121.8(3)
O3	C2	C1	117.2(2)	C16	C17	C18	119.0(3)
O3	C2	C3	124.4(2)	O8	C17	C16	116.3(2)
C4	C3	C2	120.5(3)	O8	C17	C18	124.8(3)
C3	C4	C5	121.3(3)	C17	C18	C13	119.4(3)
C4	C5	C6	119.0(3)	C7	N1	S7	123.03(18)
O4	C5	C4	116.3(3)	C12	N2	S21	124.29(18)
O4	C5	C6	124.7(3)	C2	O3	C19	117.4(2)
C5	C6	C1	119.7(3)	C5	O4	C20	118.8(2)
C8	C7	C12	119.4(3)	C14	O7	C21	117.9(2)
C8	C7	N1	120.9(3)	C17	O8	C22	117.3(2)
C12	C7	N1	119.7(2)	N1	S7	C1	106.71(11)
C9	C8	C7	119.9(3)	O1	S7	C1	106.78(13)
C10	C9	C8	120.9(3)	O1	S7	N1	108.52(12)
C9	C10	C11	119.8(3)	O2	S7	C1	110.08(13)
C10	C11	C12	120.5(3)	O2	S7	N1	104.92(13)
C7	C12	N2	119.7(2)	O2	S7	O1	119.21(13)
C11	C12	C7	119.4(3)	N2	S21	C13	107.31(11)
C11	C12	N2	120.8(3)	O5	S21	C13	109.51(13)

C14	C13	C18	121.2(2)	O5	S21	N2	104.62(12)
C14	C13	S21	121.0(2)	O6	S21	C13	106.84(13)
C18	C13	S21	117.8(2)	O6	S21	N2	108.47(13)
C13	C14	C15	118.5(3)	O6	S21	O5	119.55(13)

Table S3

Interference Effect of various cations with CDBDMBS/Nafion/GCE

Metal ions	**Observed Current (µA)**				**Interference effect (%)**	**SD (n = 3)**	**RSD (%) (n = 3)**
	R1	**R2**	**R3**	**Average**			
Ga^{3+}	13.86	12.60	12.45	12.97	100	0.773	5.95
Ag^{+}	5.86	6.06	5.97	5.97	46	0.100	1.67
As^{3+}	5.75	4.72	4.65	5.03	38	0.615	12.22
Au^{3+}	5.31	5.29	5.39	5.33	41	0.054	1.01
Ce^{2+}	4.17	4.28	3.95	4.13	31	0.165	3.99
Cr^{3+}	6.08	5.29	5.49	5.62	43	0.415	7.38
Hg^{2+}	6.65	6.44	6.35	6.48	49	0.155	2.40
Pb^{2+}	6.37	6.10	6.40	6.29	48	0.166	2.63
Y^{3+}	4.64	5.05	4.74	4.81	37	0.216	4.50

"Interference effect of Ga^{3+} is consider to be 100 % ; R = reading; SD = standard deviation; and RSD = relative standard deviation."