Supporting Information

Syntheses, Characterization and Multi-Acids Fluorescent Sensing and Electroluminescent Properties of Cr(II)-based Metallopolymers

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1-Molecular Weight of Cr(II)–RNL poly and Cr(II)-FNL poly

The Weight Average molecular weight of the Cr(II)-RNL poly, Cr(II)-RNL poly was determined by Static light scattering (SLS) with the help of Berry plot. For this, two different stock solutions were prepared for both of the polymer samples by dissolving 12 mg of polymer in 24 ml of THF solvent. These stock solutions were filtered through a 0.2 micron Nylon filter to remove solid particles, if any, to obtain a homogeneous solution. Then six different concentration solutions were prepared from this stock solution with filtered THF solvent used as dilution, and both the polymers were analyzed at different angles by SLS technique gives the (3.93± 0.10) x 10^4 g/ mol for Cr(II)-RNL poly (Fig-S-1) and (5.62± 0.10) x 10^4 g/ mol for Cr(II)-RNL Poly (Fig-S-2) shown in Berry plot.

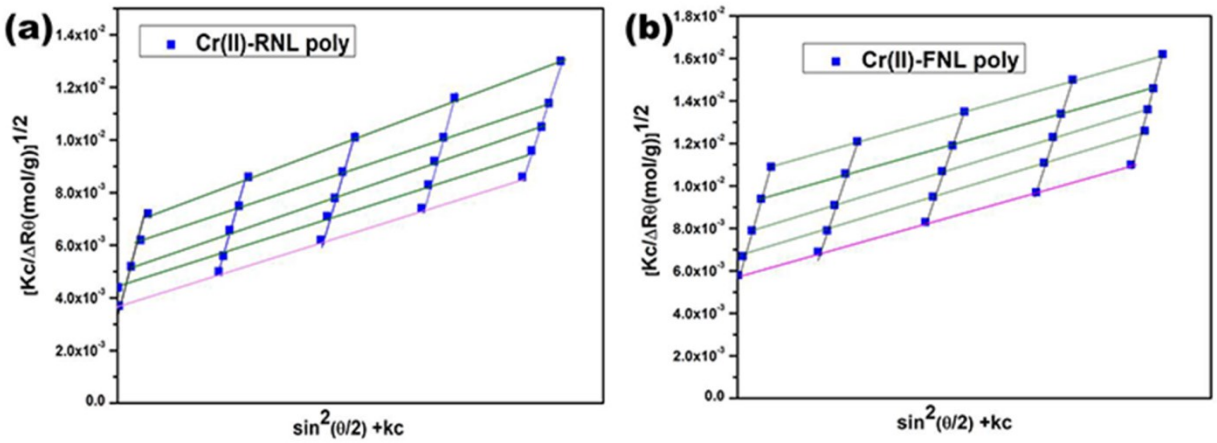

Figure S1.Berry Plot of (a) Cr(II)-RNL poly and (b) Cr(II)-FNL poly in batch mode with a solution prepared in THF

2-ATR-IR Studies of Cr(II)-RNL poly and Cr(II)-FNL poly

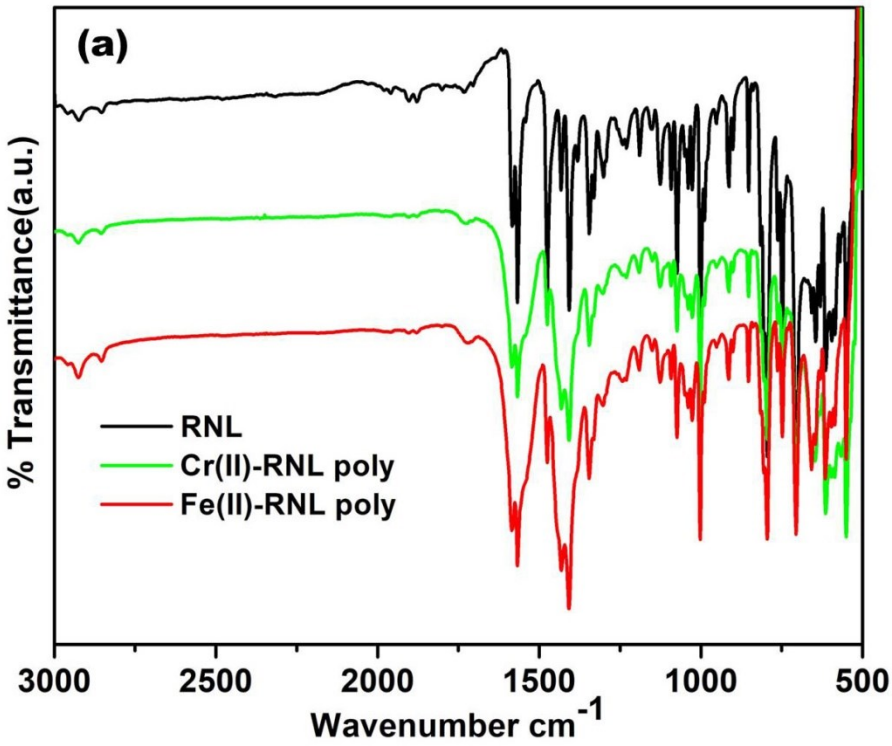

Figure S2. (a) Overlaid ATR-IR spectra of RNL and Cr(II)-RNL poly with Fe(II)-RNL poly

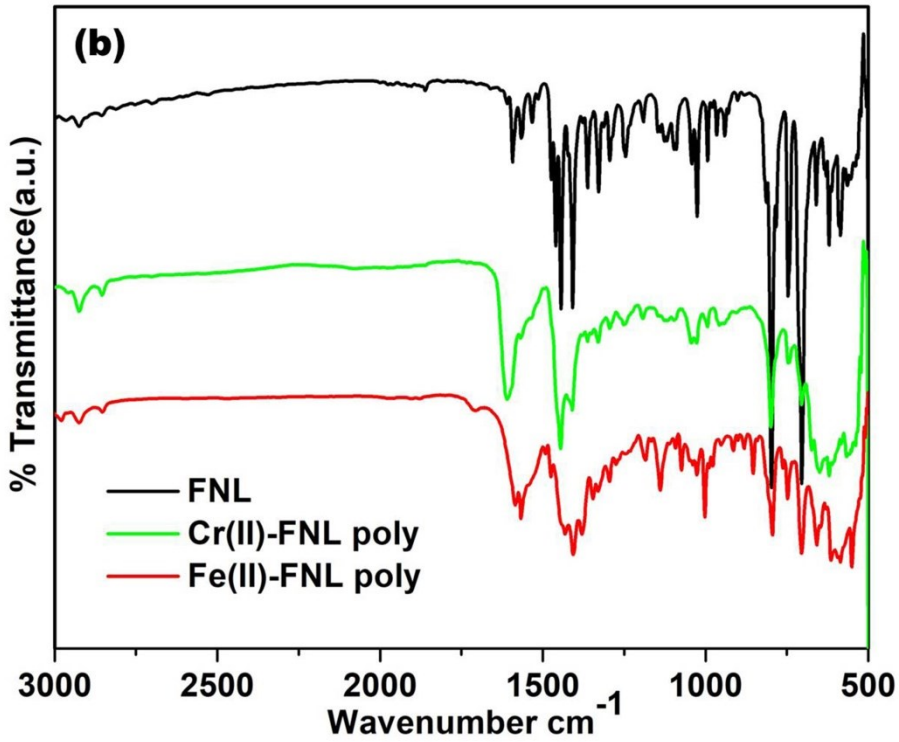

Figure S2. (b) Overlaid ATR-IR spectra of FNL and Cr(II)-FNL poly with Fe(II)-FNL poly

3-MM_2 energy minimizations of Cr(II)-RNL poly and Cr(II)-FNL poly

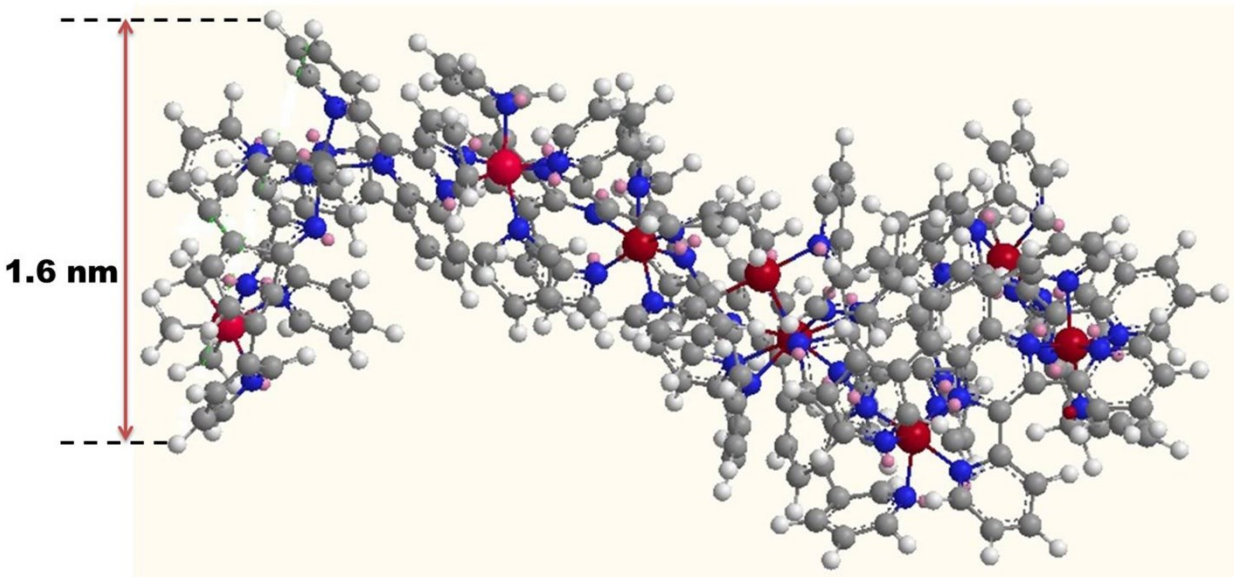

Figure S3. Reduced structure of Cr(II)-RNL poly 8 units in the polymer chains and its thickness measurements

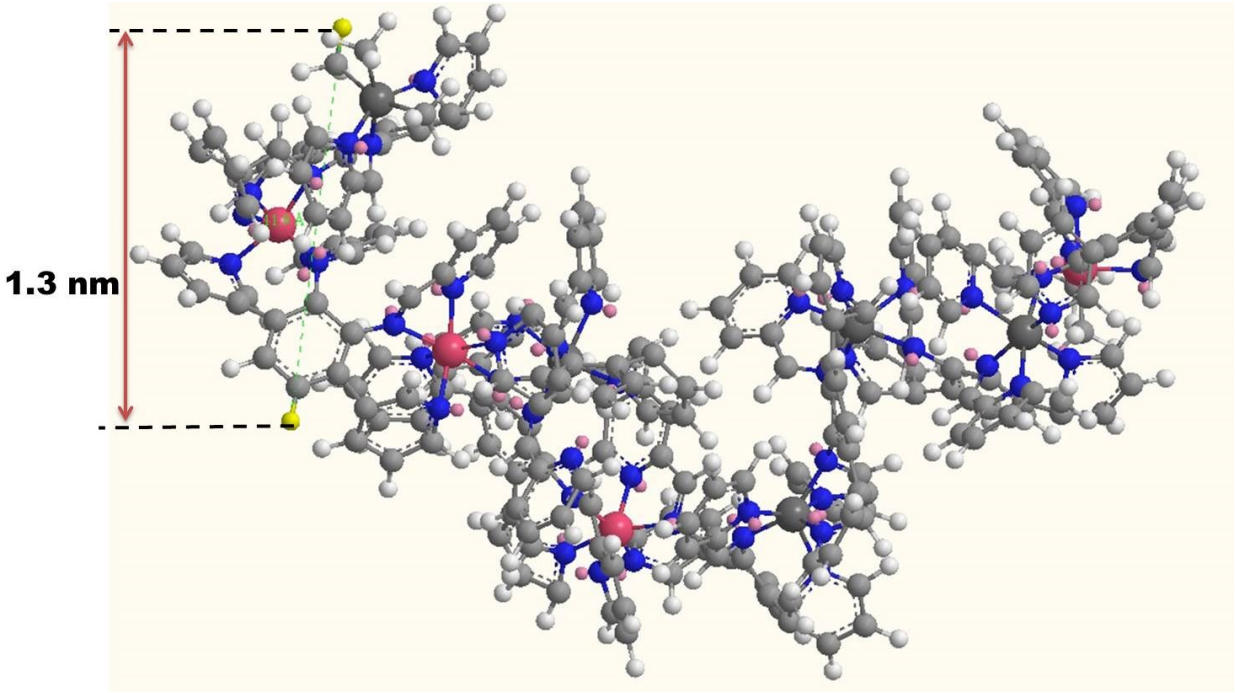

Figure S4. Reduced structure of Cr(II)-FNL poly 8 units in the polymer chains and its thickness measurements

4- XRD Studies of Cr(II)-RNL poly and Cr(II)-FNL poly

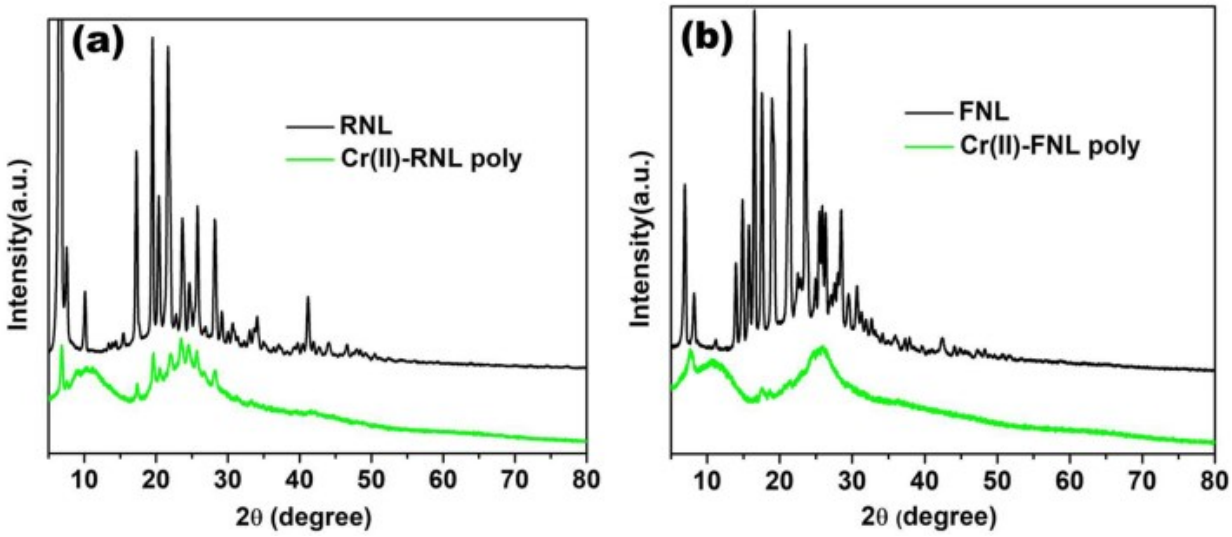

Figure S5. XRD graph of RNL and Cr(II)-RNL poly (b) XRD graph of FNL and Cr(II)-FNL poly

5- ^{1}H-NMR Studies of Cr(II)-RNL poly and Cr(II)-FNL poly with different Acids

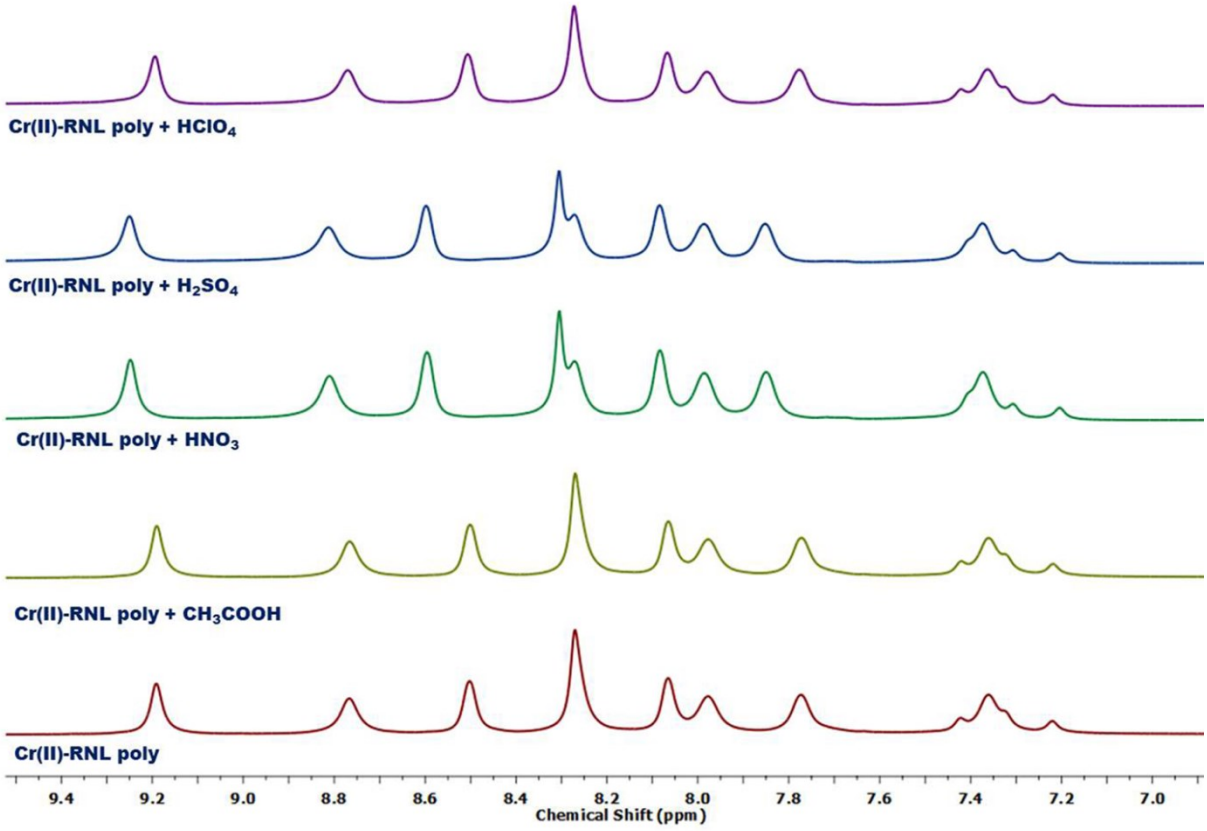

Figure S6. Overlaid ^{1}H-NMR spectrum of Cr(II)-RNL poly with different acids in DMSO-d_6

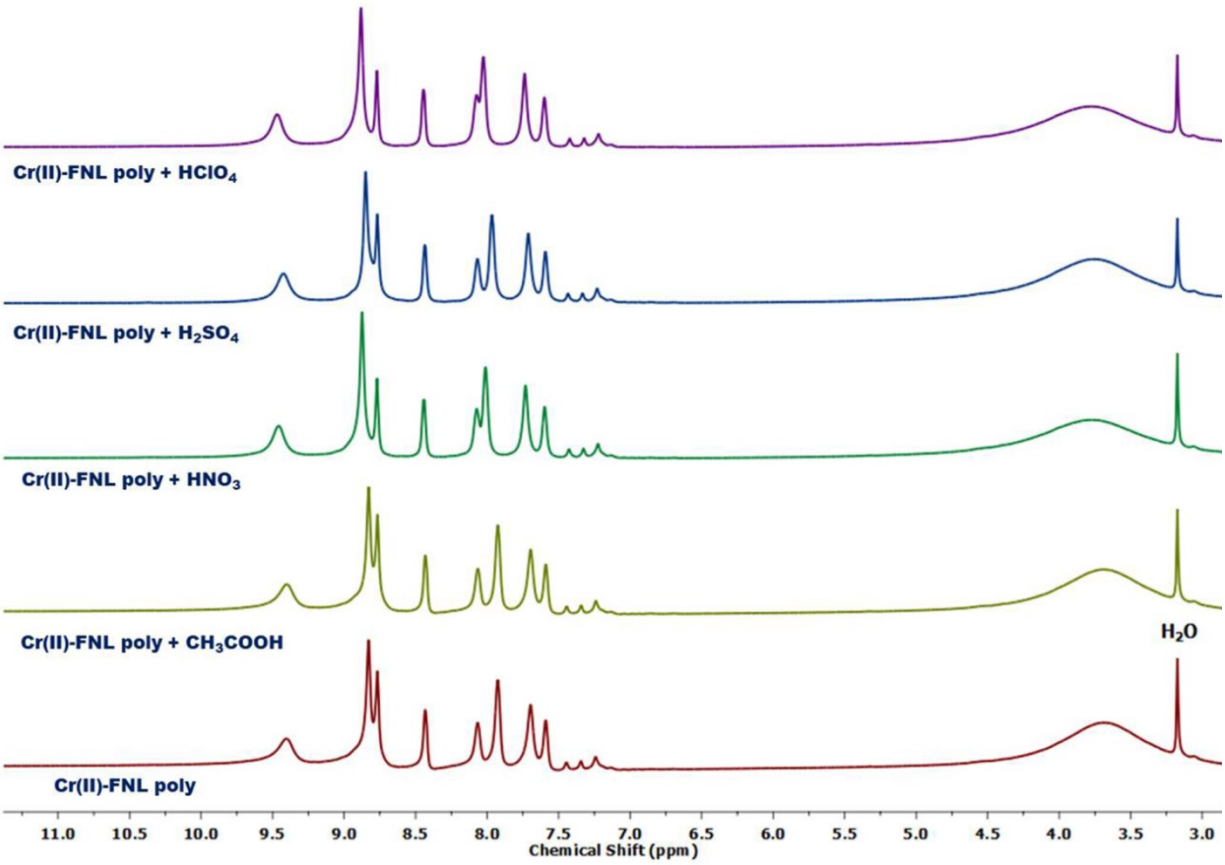

Figure S7. Overlaid ^{1}H-NMR spectrum of Cr(II)-FNL poly with different acids in DMSO-d_6

6- Conductivity of Cr(II)-RNL poly and Cr(II)-FNL poly solutions in Methanol

Table-S-1. Conductivity of Cr(II)-RNL poly and Cr(II)-FNL poly solutions in Methanol

Sr No.	Concentration (M)	Cr(II)-RNL poly (Conductivity µS)	Cr(II)-FNL poly (Conductivity µS)
1	CH_3OH	1.37	1.37
2	10^{-2}	574	666
3	10^{-3}	86	102
4	10^{-4}	10.02	50
5	10^{-5}	2.75	10.11

7- Strength of Used Acid

Table-S-2. Strength of Acid after dilution in 2 µl

S. No.	Acid	Strength of Used Acid	Strength of Acid after dilution in 2 µl
1	CH_3COOH	17.39 M	1.73×10^{-2} M
2	HNO_3	15.8 M	1.58×10^{-2} M
3	H_2SO_4	18.4 M	1.84×10^{-2} M
4	$HClO_4$	11.56 M	1.15×10^{-2} M

8- Sensing of acids in the complex medium

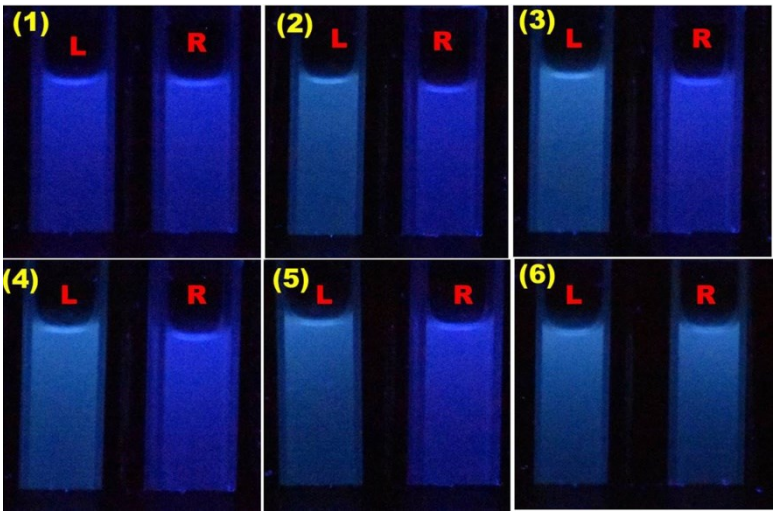

Figure S8. Sensing ability of Cr(II)-RNL poly solution in complex medium

Image 1. L-Polymer Solution (Blank): R- Polymer Solution (Blank) ,**Image 2.** L -Polymer Solution + 2 µl (4×10^{-4} M) H_2SO_4 : R- Polymer Solution (Blank), **Image 3.** L-Polymer Solution + 2 µl (4×10^{-4} M) H_2SO_4 : R-(10^{-3} M Glucose),**Image 4.** L-Polymer Solution + 2 µl (4×10^{-4} M) H_2SO_4 : R-(10^{-3} M Glucose + 10^{-3} M Picric Acid), **Image 5.** L-Polymer Solution + 2 µl (4×10^{-4} M) H_2SO_4 : R-(10^{-3} M Glucose + 10^{-3} M Picric Acid + 10^{-3} M Starch), **Image 6.** L-Polymer Solution + 2 µl (4×10^{-4} M) H_2SO_4 : R- (10^{-3} M Glucose+ 10^{-3} M Picric Acid + 10^{-3} M Starch + 2 µl (4×10^{-4} M) H_2SO_4

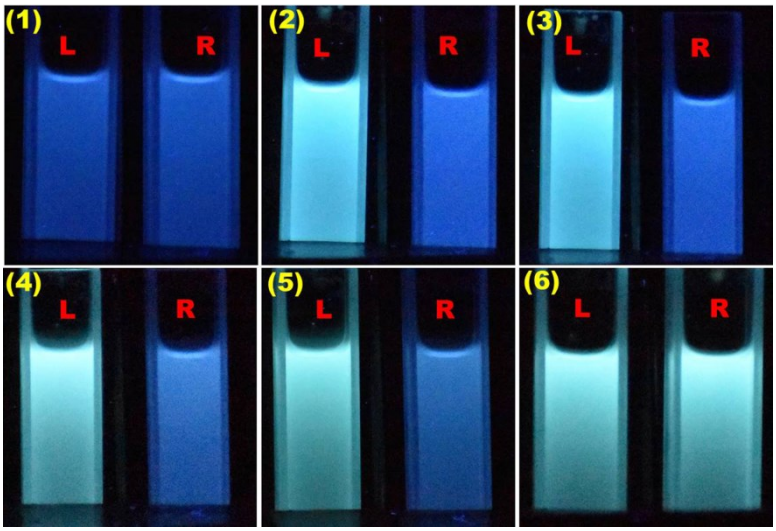

Figure S9. Sensing ability of Cr(II)-FNL poly solution in complex medium

Image 1. L-Polymer Solution (Blank): R- Polymer Solution (Blank), **Image 2.** L -Polymer Solution + 2 µl ($4x10^{-4}$ M) H_2SO_4 : R-Polymer Solution (Blank), **Image 3.** L-Polymer Solution + 2 µl ($4x10^{-4}$ M) H_2SO_4 : R-(10^{-3} M Glucose), **Image 4.** L-Polymer Solution + 2 µl ($4x10^{-4}$ M) H_2SO_4 : R-(10^{-3} M Glucose + 10^{-3} M Picric Acid), **Image 5.** L-Polymer Solution + 2 µl ($4x10^{-4}$ M) H_2SO_4 : R-(10^{-3} M Glucose + 10^{-3} M Picric Acid + 10^{-3} M Starch)**Image 6.** L-Polymer Solution + 2 µl ($4x10^{-4}$ M) H_2SO_4 : R-(10^{-3} M Glucose+ 10^{-3} M Picric Acid + 10^{-3} M Starch + 2 µl ($4x10^{-4}$ M) H_2SO_4

We have done above experiment by adding one after another chemical to check whether our developed metallopolymer is sensing them or it exclusively senses only acid protons. We have introduced first glucose, followed by picric acid and then starch (all of them contain hydroxyl protons) to see whether they are sensed by metallopolymers or not but it did not show any sensing property to hydroxyl protons and thus confirmed that it can only sense acidic protons (Acetic, Sulphuric, Nitric, Perchloric). Fluorescence change was observed in polymer solution containing all other added chemicals only after addition of 2 µl ($4x10^{-4}$ M) H_2SO_4.

9- Fluorescence lifetime Data

Table-S-3. The fluorescence lifetime of Cr(II)-RNL and Cr(II)-FNL poly with different acids in methanol

Sample	λem (nm)	χ^2	τ_1 (ns)	α_1 (%)	τ_2 (ns)	α_2 (%)	Average Lifetime (ns)
RNL	435	1.00	0.79	73.39	1.99	26.30	1.10
Cr(II)-RNL poly	435	0.94	1.13	90.17	1.94	9.83	1.21
Cr(II)-RNL poly + CH_3COOH	435	0.93	1.25	90.68	2.07	9.32	1.32
Cr(II)-RNL poly + HNO_3	434	0.98	1.20	98.82	3.08	1.18	1.22
Cr(II)-RNL poly + H_2SO_4	437	1.40	1.21	92.46	4.90	7.54	1.48
Cr(II)-RNL poly + $HClO_4$	436	1.44	1.24	96.29	4.49	3.71	1.36
FNL	409	0.98	0.93	55.83	2.02	44.57	1.41
Cr(II)-FNL poly	434	0.95	1.18	64.27	2.49	35.73	1.64
Cr(II)-FNL poly +CH_3COOH	434	0.99	1.23	71.40	2.53	28.60	1.60
Cr(II)-FNL poly + HNO_3	472	1.08	1.81	83.13	5.74	16.87	1.94
Cr(II)-FNL poly + H_2SO_4	471	1.34	1.82	31.04	7.00	68.95	5.39
Cr(II)-FNL poly + $HClO_4$	473	1.24	2.15	44.60	6.67	55.40	4.65

10- Cyclic Voltammetry data of ligands (RNL and FNL)

Table-S-4. Cyclic Voltammetry data of ligands

Compound	Reduction potential $-E_{1/2}$ V
RNL	-1.40 ,-0.42
FNL	-1.30, -0.81, -0.35

11- Cyclic voltammogram of (a) Cr(II)-RNL poly and (b) Cr(II)-RNL poly with different acid

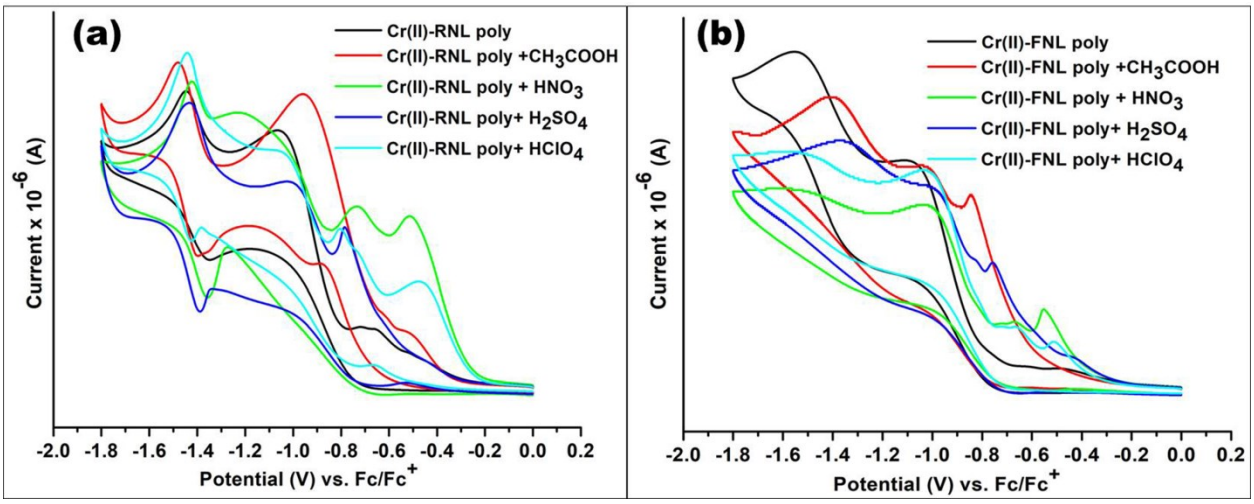

Figure S10. Cyclic voltammogram of (a) Cr(II)-RNL poly and (b) Cr(II)-RNL-poly in dichloromethane with different acids containing 0.1 M TBAP at 100mV/s with Glassy Carbon working electrode

12- Spectroelectrochemistry of Cr(II)-RNL poly and Cr(II)-FNL poly

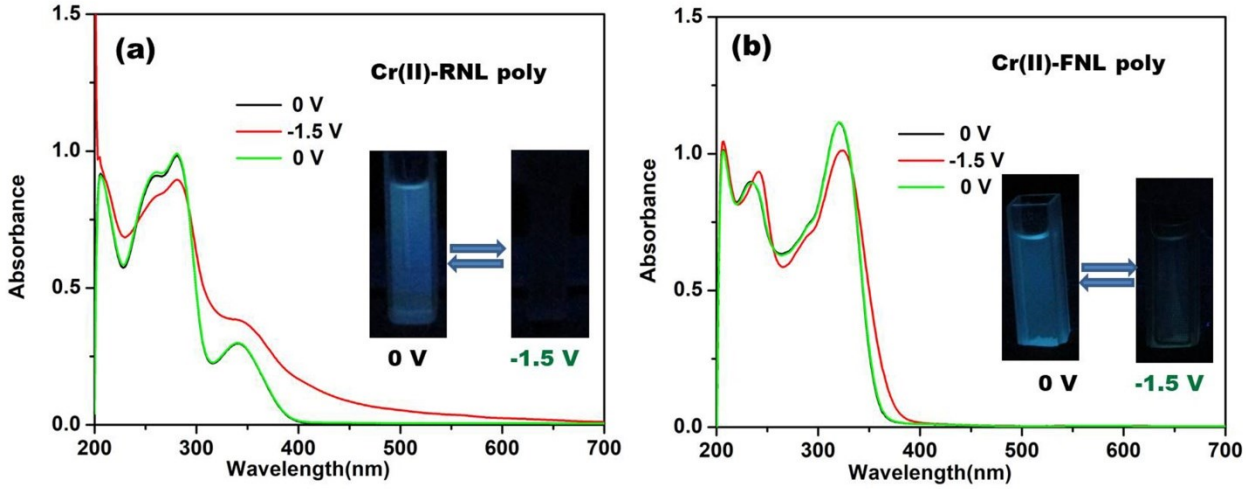

Figure S11. Reversible Spectroelectrochemical spectra of (a) Cr(II)-RNL poly (b) Cr(II)-FNL poly in DCM