Supporting Information

Highly selective chemo-sensor for repetitive detection of Fe^{3+} in pure water and bio-imaging

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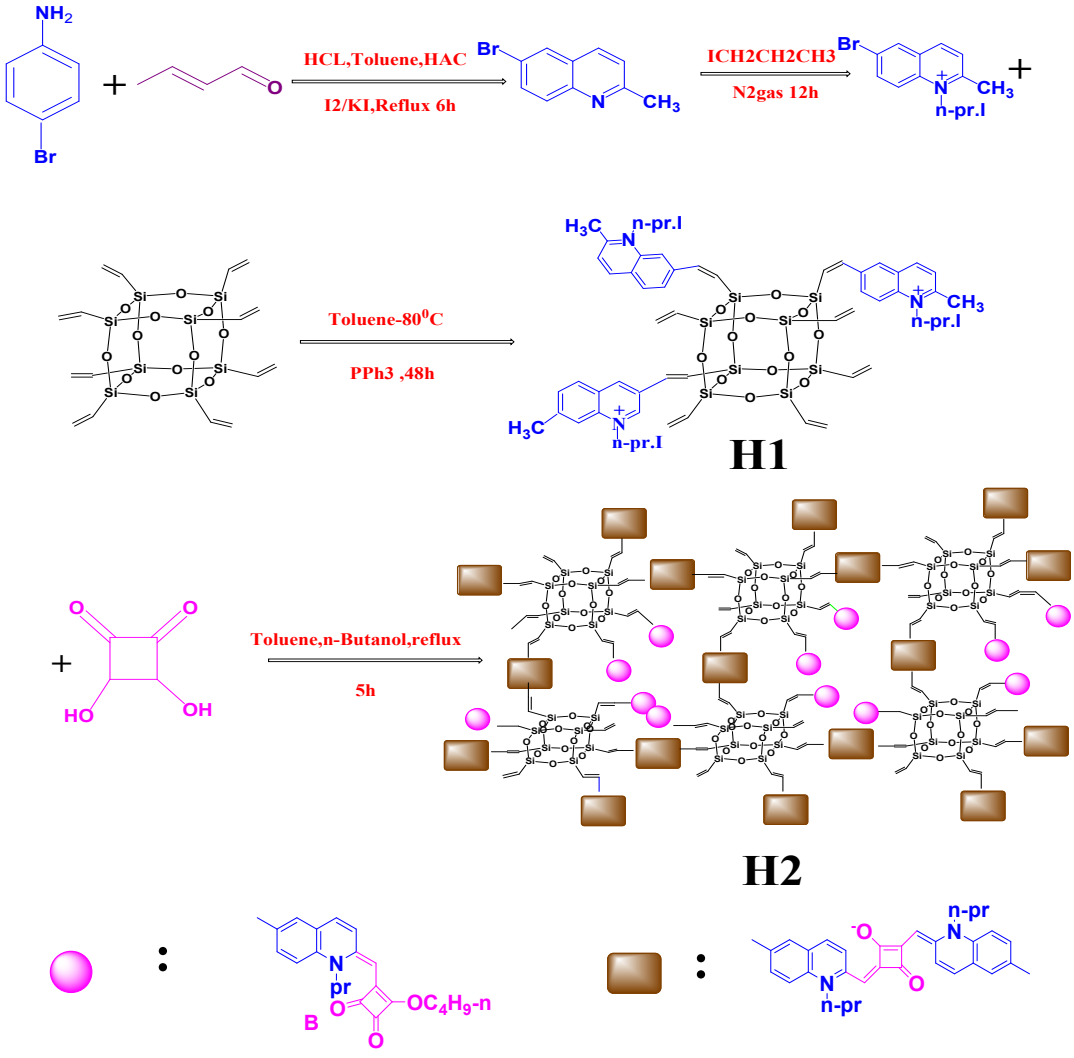

Scheme The synthetic routes of target hybrid H1 and H2.

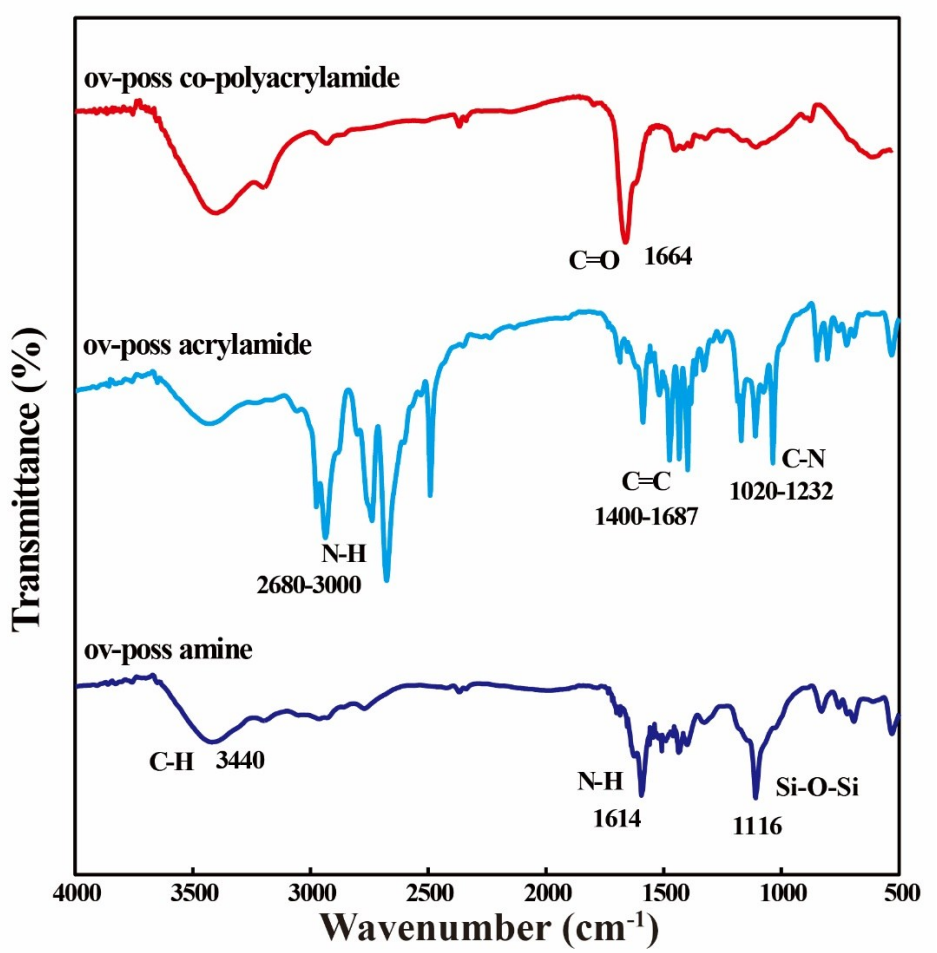

Figure S1. FTIR spectra of ov-poss amine, ov-poss acryl amide and ov-poss co-poly acryl amide.

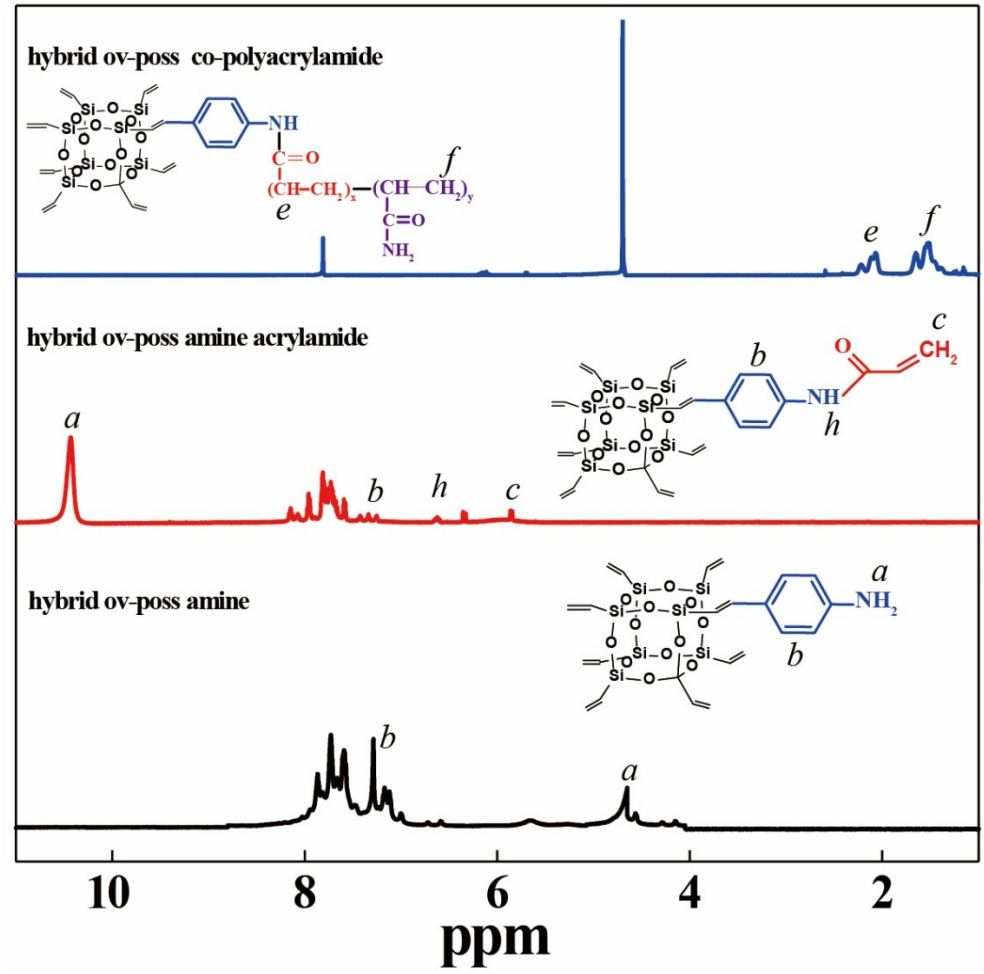

Figure S2. NMR spectra of ov-poss amine, ov-poss acryl amide and ov-poss co-poly acryl amid.

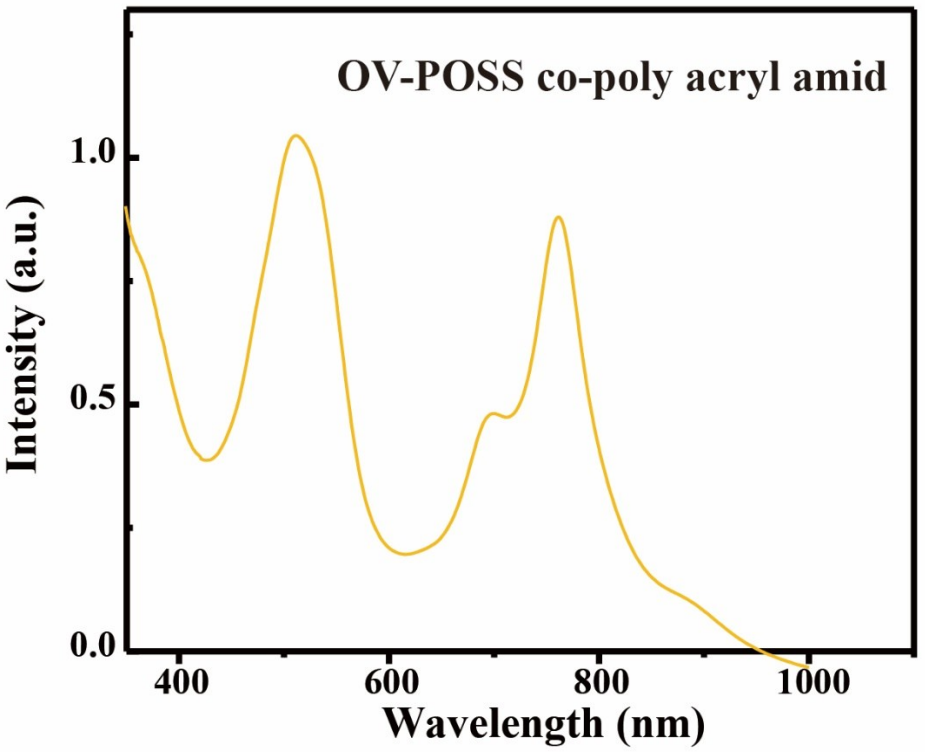

Figure S3. UV-vis absorbance spectra of ov-poss co-poly acryl amid.

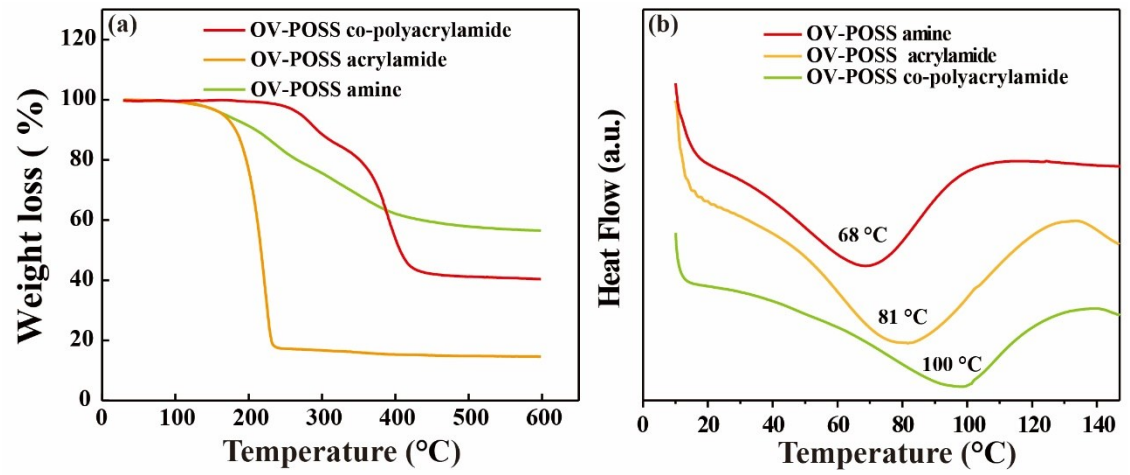

Figure S4 (a) TGA thermo grams of OV-POSS amine, OV-POSS acryl amide and OV-POSS co-poly (acryl amid) measured under N_2 at a heating rate of 10 °C min^{-1}. (b) DSC spectra of OV-POSS amine, OV-POSS acryl amide and OV-POSS co-poly (acryl amid).

The thermal aging of poly acryl amide divided into several regions depending on the temperature, the first below about 100 - 200 ^{0}C, the second between approximately 200 - 300 ^{0}C and the third above 300 °C. The thermo gram of hybrid OV-POSS amine showed the losing 5% of weight at 167 °C and at 390 °C at weight losing 37 %. OV-POSS co-poly (acryl amid) has two decomposition at 7 % weight loss at 173 °C and the last decomposition at 240 °C. And OV-POSS co-poly (acryl amid), showed loss in mass three times, which may due to strong chemical interaction between their components. The first weight loss, at 100 ^{0}C, was related to moisture removal, with the sample losing 5 % weight at 275^{0}C. The second weight loss from 15 % of at 333 ^{0}C, was refer to the thermal decomposition of the amide side groups, which leads to the release of ammonia and other gaseous species of poly acryl amide structure formed during the decomposition of poly acryl amide. In the third one, a sharp weight loss 58 % occurred at 445 °C, which may have been due to co-polymer backbone degradation. The DSC of hybrid OV-POSS amine, hybrid OV-POSS acryl amide and hybrid OV-POSS co-poly (acryl amid). **Figure S4b**

shows characteristic bands. All DSC thermo grams displays single glass transition temperatures (Tg) notably, the Tg of precursor hybrid OV-POSS amine was observed at 68 °C. With the addition of the hybrid OV-POSS acryl amide increased to 81 °C and 100 °C for OV-POSS co-poly (acryl amide).

Table Determination of polymer molecular weight of by ulrich viscosity method

C mg/ml	Efflux time t/s	$\mu_r=t/t_0$	$\mu_{sp}=t-t_0/t_0$	μlnh=ln(μ_r)/c	$\mu_{red}=\mu_{sp}/c$
0	71	0	0	0	0
4	94	1.3	0.3	0.0712	0.075
6	106	1.5	0.5	0.0675	0.083
8	121	1.7	0.7	0.0663	0.087
10	135	1.9	0.9	0.06418	0.09

$[\eta] = \lim_{c-0}(\eta_{sp}/C)=0.066ml/mg=66ml/g$ …… (1)

$[\eta] = \lim_{c-0}(In\eta_r/C)=0.075ml/mg=75ml/g$ …… (2)

And the average from these is $[\eta]$ = 70. 5 ml/g.

Viscosity average molecular weight from Mark-Houwink equation:

$[\eta] = k * M$ ---- $M = ([\eta]/k)$

$M = ([\eta]/k) = (70.5/0.0000631) = 1117274$