Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Water-soluble and fluorescence adjustable copolymers containing a hydrochromic dye: synthesis, characterization and properties

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1. NMR and IR spectra of AM-Rh and poly(AM-Rh$_x$ *co* NIPAM$_y$)s

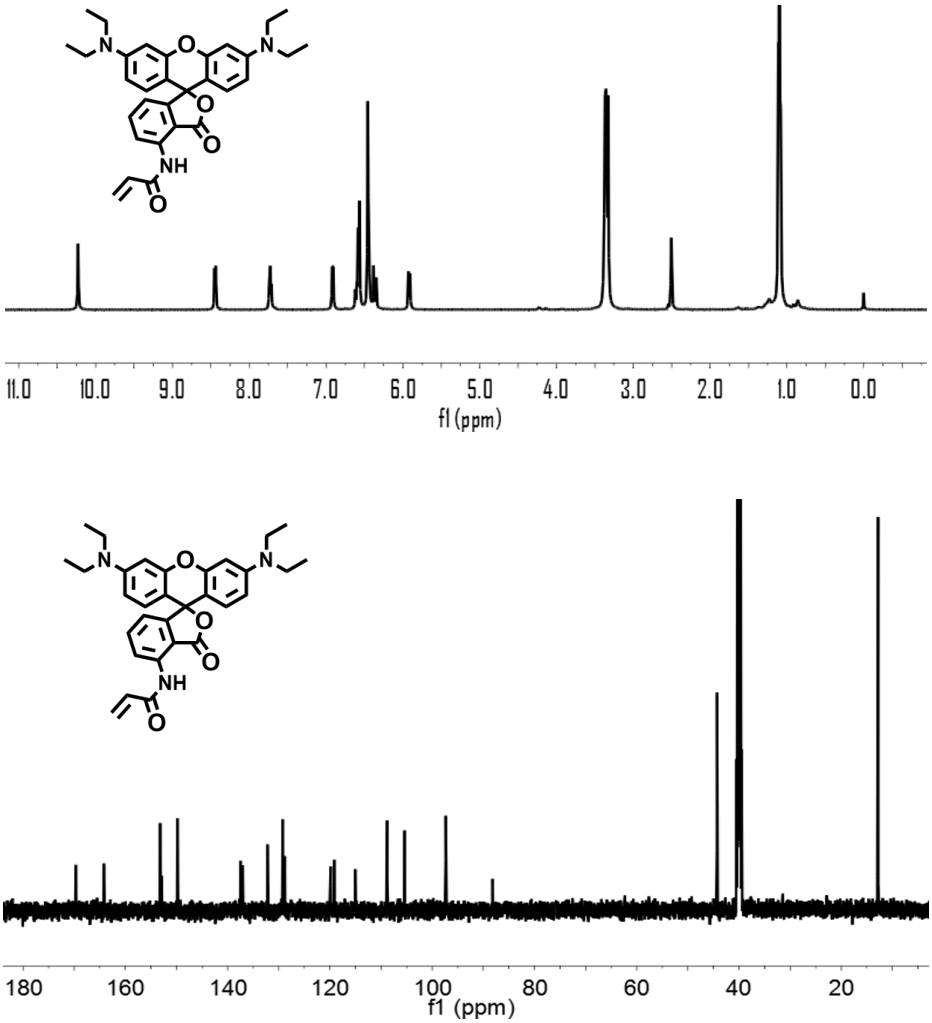

Figure S1. ^{1}H NMR and ^{13}C NMR of AM-Rh.

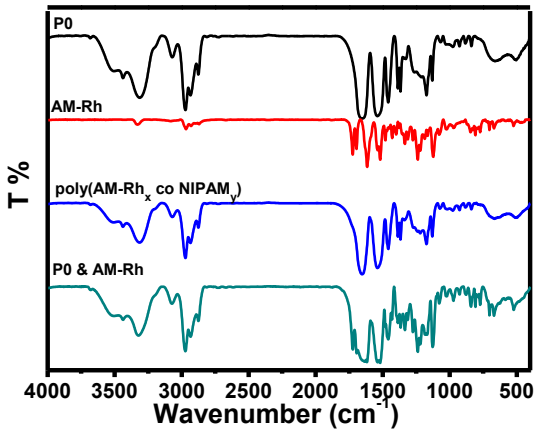

Figure S2. Infrared spectrum of **P0**, AM-Rh, **P1/50** and mixture of **P0** & AM-Rh.

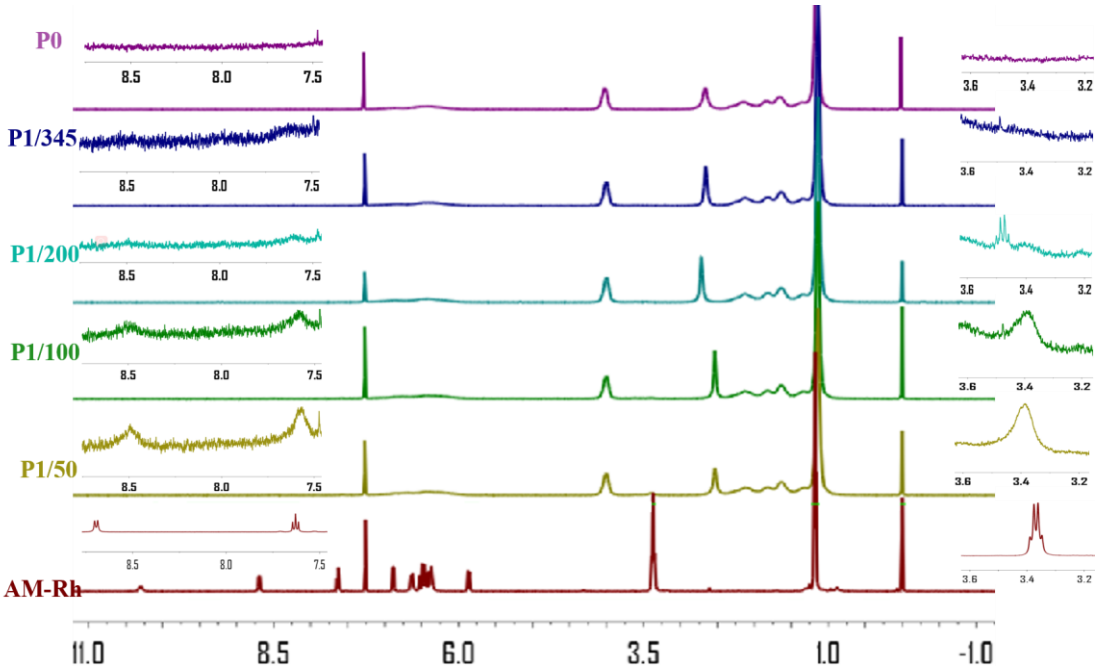

Figure S3. ^{1}H NMR spectrums of **P1/50, P1/100, P1/200, P1/345, P0**.

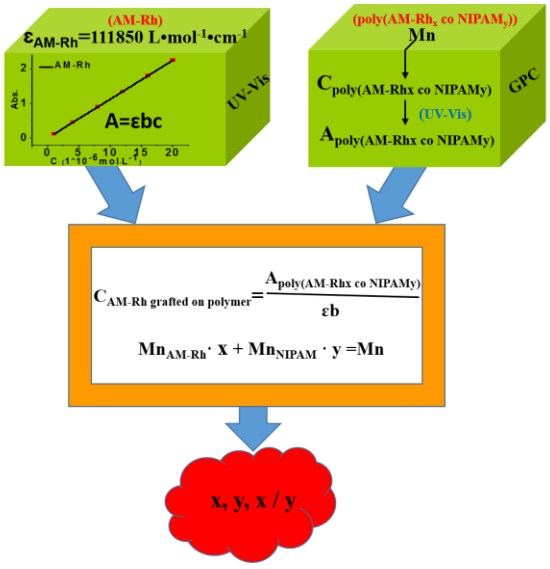

Figure S4 Schematic diagram for calculating values of x, y, and x / y.

2. Test and calculation of molar absorption coefficient of AM-Rh

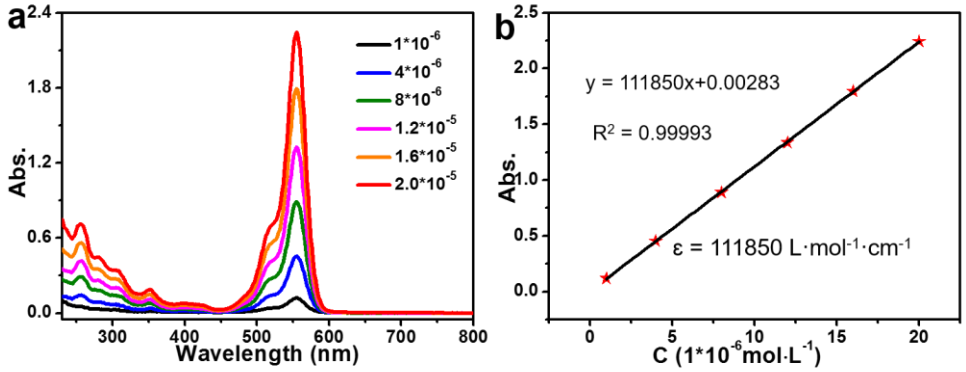

Figure S5. a) The UV-Vis spectra of AM-Rh in methol with concentration ranging from 1 $\times 10^{-6}$ mol L^{-1} to 2 $\times 10^{-5}$ mol L^{-1}. b) Absorbance values plotted against concentration in MeOH, molar absorption coeffcient (ε) of AM-Rh was calculated as 111850 L mol^{-1} cm^{-1}.

3. GPC raw date

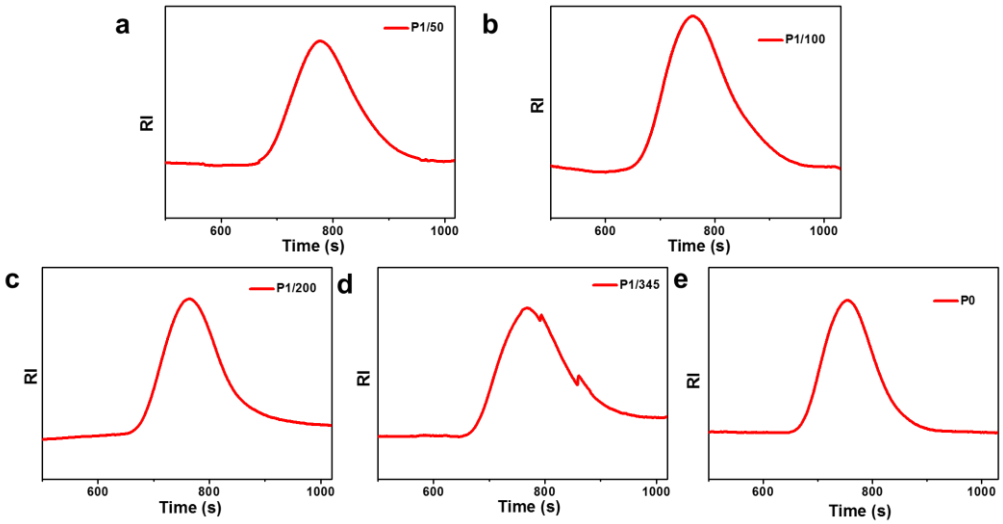

Figure S6. The raw GPC data of polymer.

4. The contrast between halochromism of AM-Rh and hydrochromism

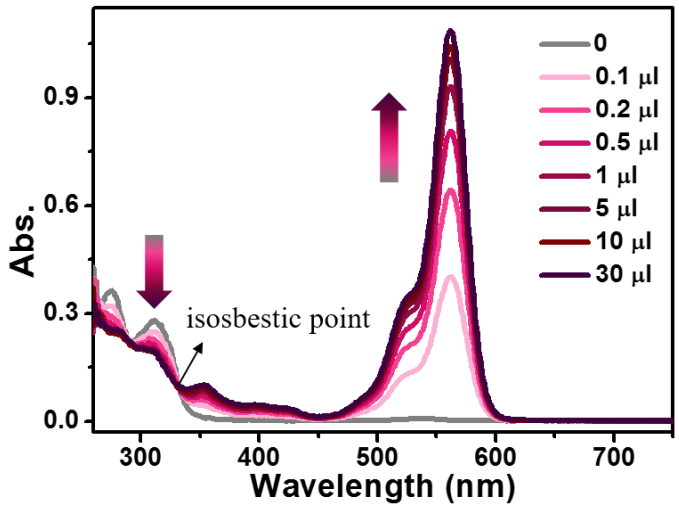

Figure S7. The UV-Vis spectra of AM-Rh (C = 1 $\times 10^{-5}$ mol L^{-1}) in DMF with gradually adding CF_3COOH.

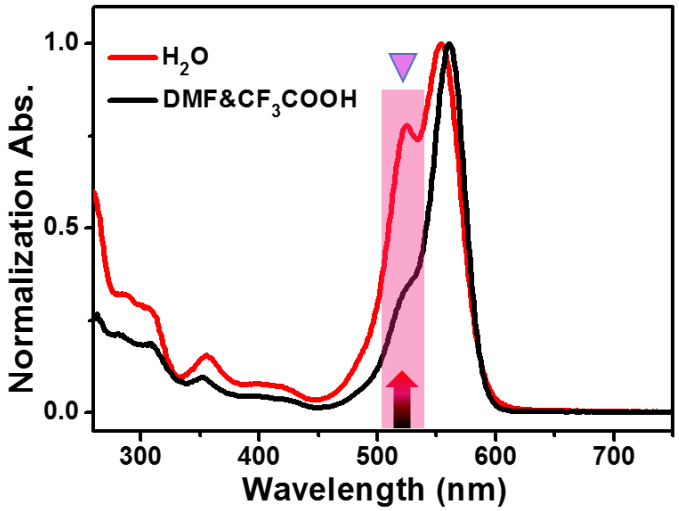

Figure S8. Normolized UV-Vis spectra of the solution of **P1/100** (0.2 mg / mL) in water and in DMF with addition of CF_3COOH.

5. The solubility of P0 in DMF-H_2O mixed systems

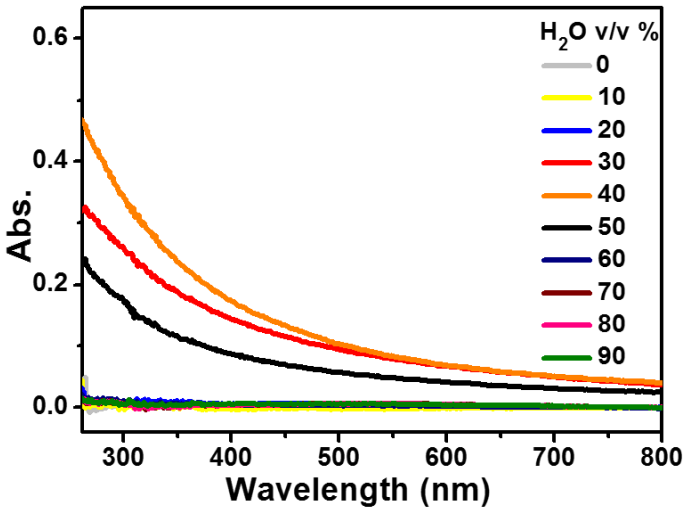

Figure S9. The UV-Vis spectra of the solution of **P0** (0.2 mg / mL) in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90% at 25 ºC.

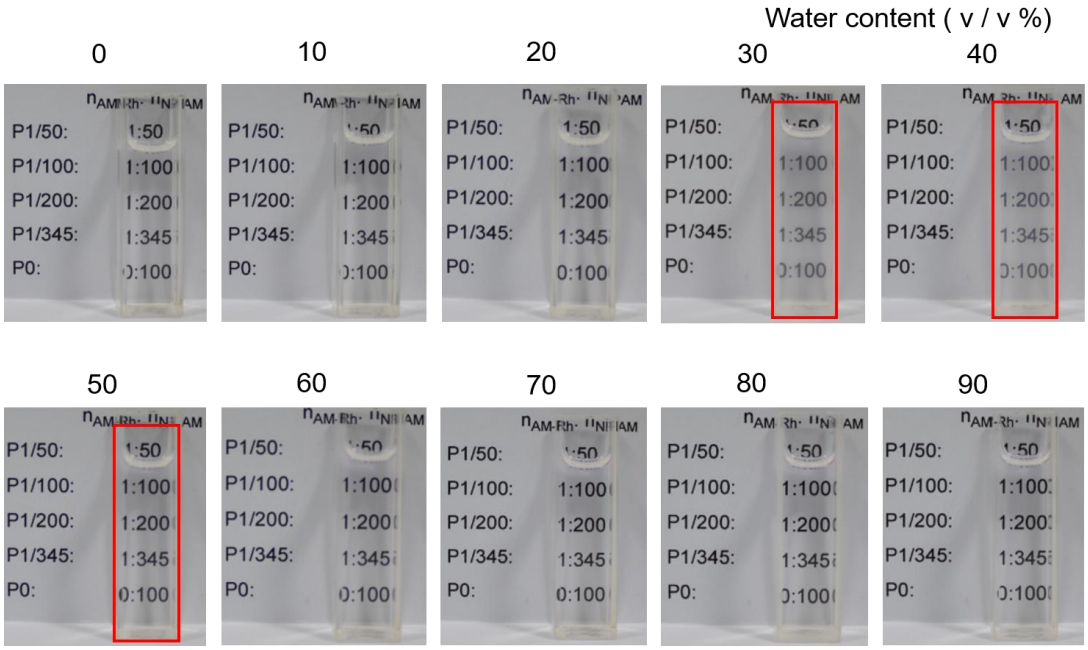

Figure S10. Photographs of **P0** (0.2 mg / mL) in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90% at 25 ºC.

6. Halochromism of P1/100 and hydrochromic of AM-Rh in mixtures of DMF-H_2O

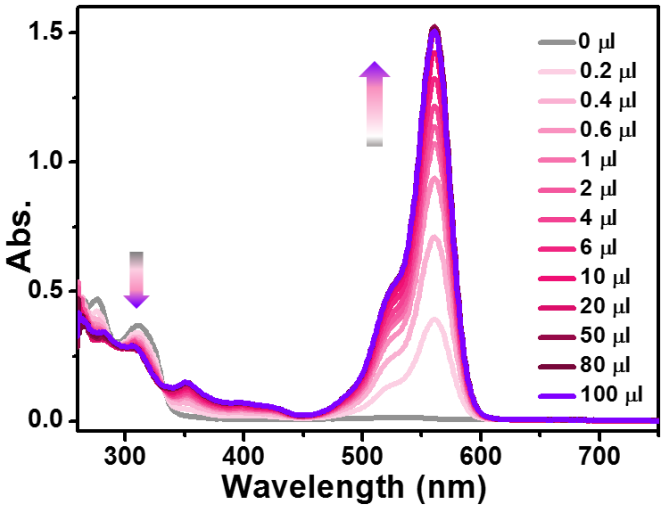

Figure S11. The UV-Vis spectra of **P1/100** (0.2 mg / ml) in DMF with adding CF_3COOH.

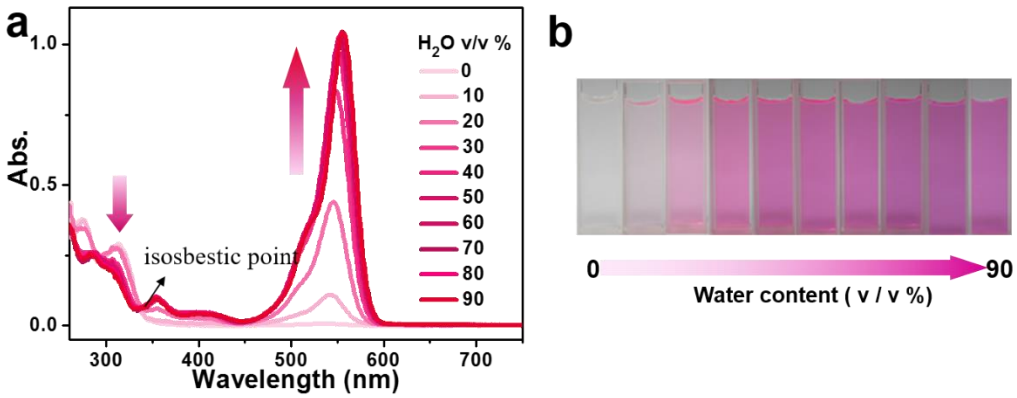

Figure S12. a) UV-Vis spectra of the solution of AM-Rh (C = 1 × 10^{-5} mol L^{-1}) in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90%. b) The corresponding photographs of AM-Rh in different water contents.

7. Halochromism and florescence of AM-Rh in DMF with adding CF_3COOH

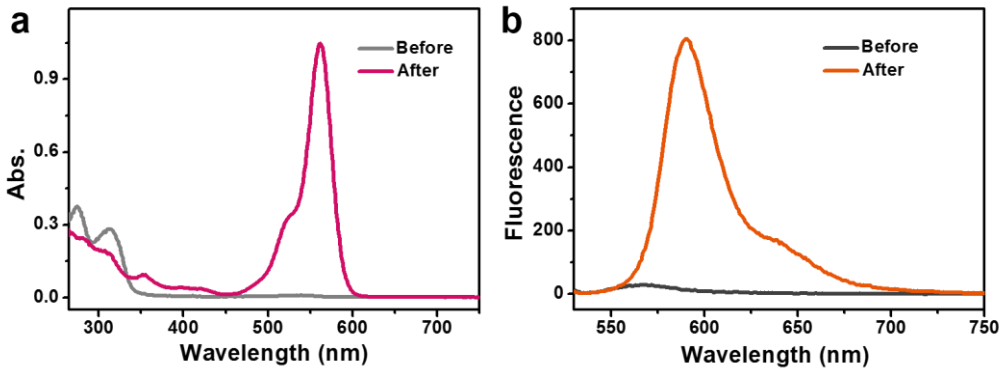

Figure S13. a) The UV-Vis spectra of AM-Rh (C = 1 × 10^{-5} mol L^{-1}) in DMF before (gray) and after (magenta) adding CF_3COOH. b) Fluorescence of AM-Rh (C = 1 × 10^{-5} mol L^{-1}) in DMF before (gray) and after (orange) adding CF_3COOH (λ_{ex} = 530 nm; slit width: 3, 1.5).

8. Hydrochromic and florescence of NH_2-Rh in mixtures of DMF-H_2O

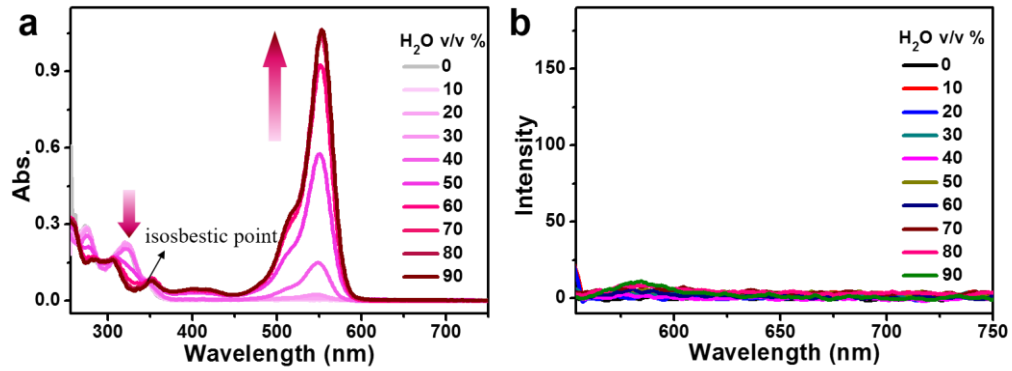

Figure S14. a) UV-vis spectra of the solution of NH_2-Rh (C = 1 × 10^{-5} mol L^{-1}) in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90%. b) The fluorescence spectra of the solution of NH_2-Rh in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90% at 25 °C (C = 1 × 10^{-5} mol L^{-1}, λ_{ex} = 530 nm; slit width: 3, 1.5).

9. Florescence of AM-Rh in mixtures of DMF-H_2O

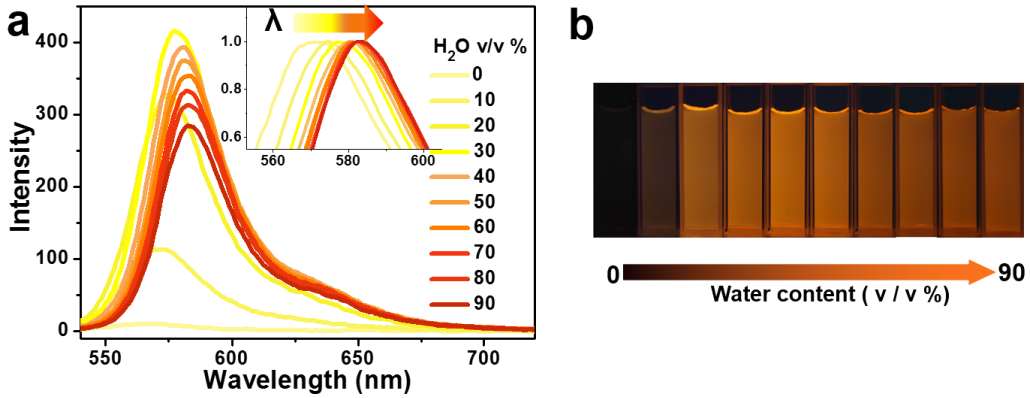

Figure S15. a) The fluorescence spectra of the solution of AM-Rh in variable mixtures of DMF and water with increasing percentage of water by volume from 0 to 90% at 25 °C (C = 1 × 10^{-5} mol L^{-1}, λ_{ex} = 530 nm; slit width: 3, 1.5). b) The corresponding fluorescence photographs of AM-Rh in different water contents.

10. Florescence of AM-Rh vary with temperature

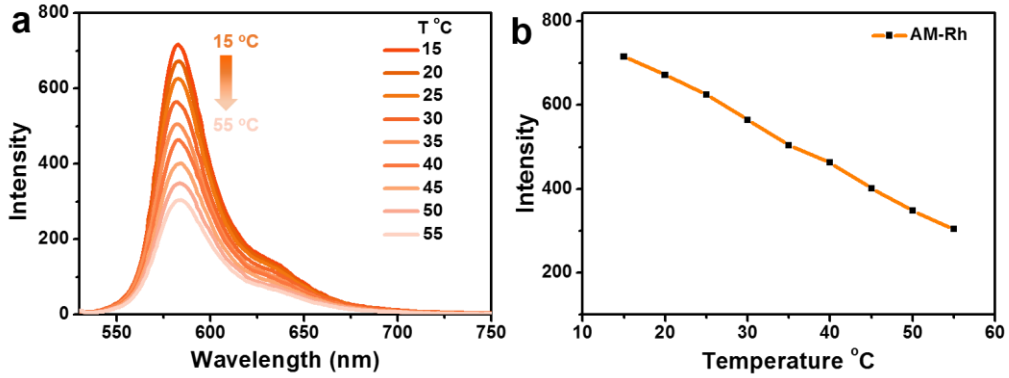

Figure S16. a) The fluorescence spectra of the solution of AM-Rh (C = 1 × 10^{-5} mol L^{-1}) in H_2O with varying temperature from 15 to 55 °C (λ_{ex} = 530 nm; slit width: 3, 1.5). b) Fluorescence changes of AM-Rh (C = 1 × 10^{-5} mol L^{-1}) in H_2O with varying temperature from 15 to 55 °C.