

## Supporting Information

### Adsorption isotherms and kinetic studies for the removal of toxic reactive dyestuffs from contaminated water using a viologen-based covalent polymer

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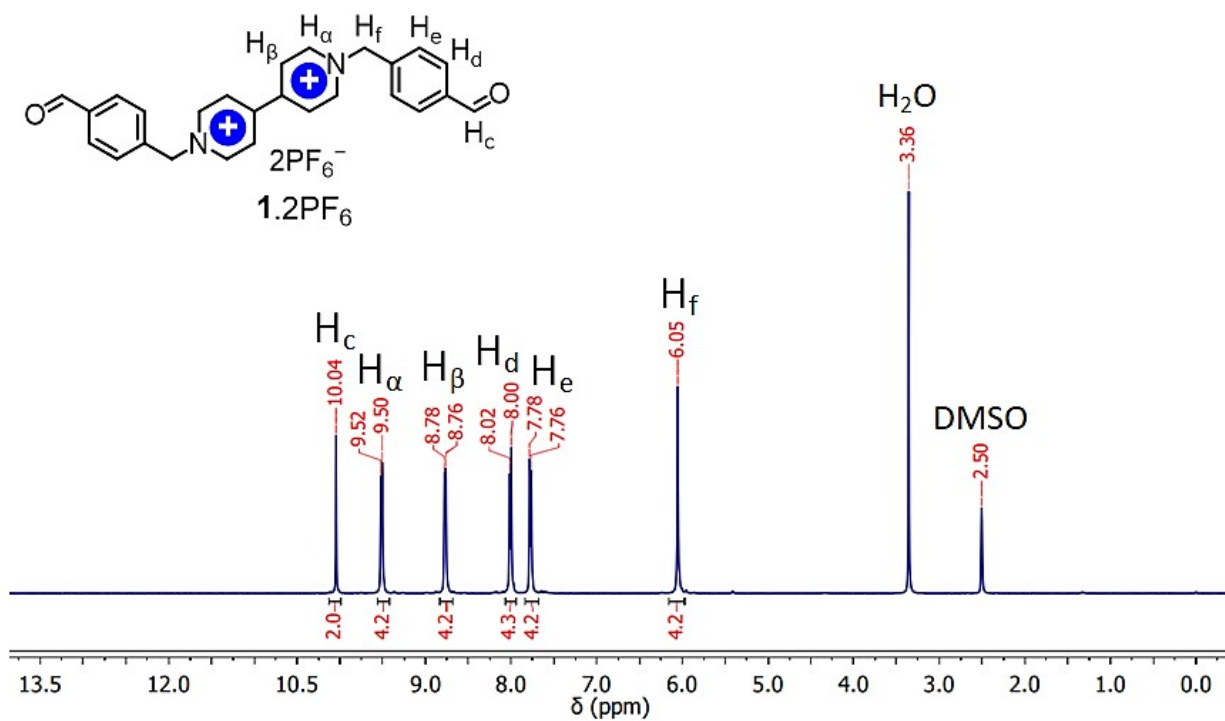
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### **Synthesis of 1,1'-bis(4-formylbenzyl)-[4,4'-bipyridine]-1,1'-dium dibromide 1.2Br<sup>[1]</sup>**

A solution of 4-(bromomethyl)benzaldehyde (2.5 g, 12.5 mmol) in 10 mL of dry and degassed DMF was added to 4,4'-bipyridine (979.6 mg, 6.28 mmol) in 10 mL of dry and degassed DMF and the mixture was heated at 90 °C under nitrogen atmosphere for 6 h. The precipitate was filtered, washed with DMF and diethyl ether, and dried in vacuo to afford 3.4 g of a yellow powder. The yellow powder was dissolved in deionized water (20 mL), and 10 mL of a saturated aqueous solution of  $\text{NH}_4\text{PF}_6$  was added dropwise to afford 1.2PF<sub>6</sub>. The obtained solid was filtered, washed with deionized water, diethyl ether, and dried in vacuo.

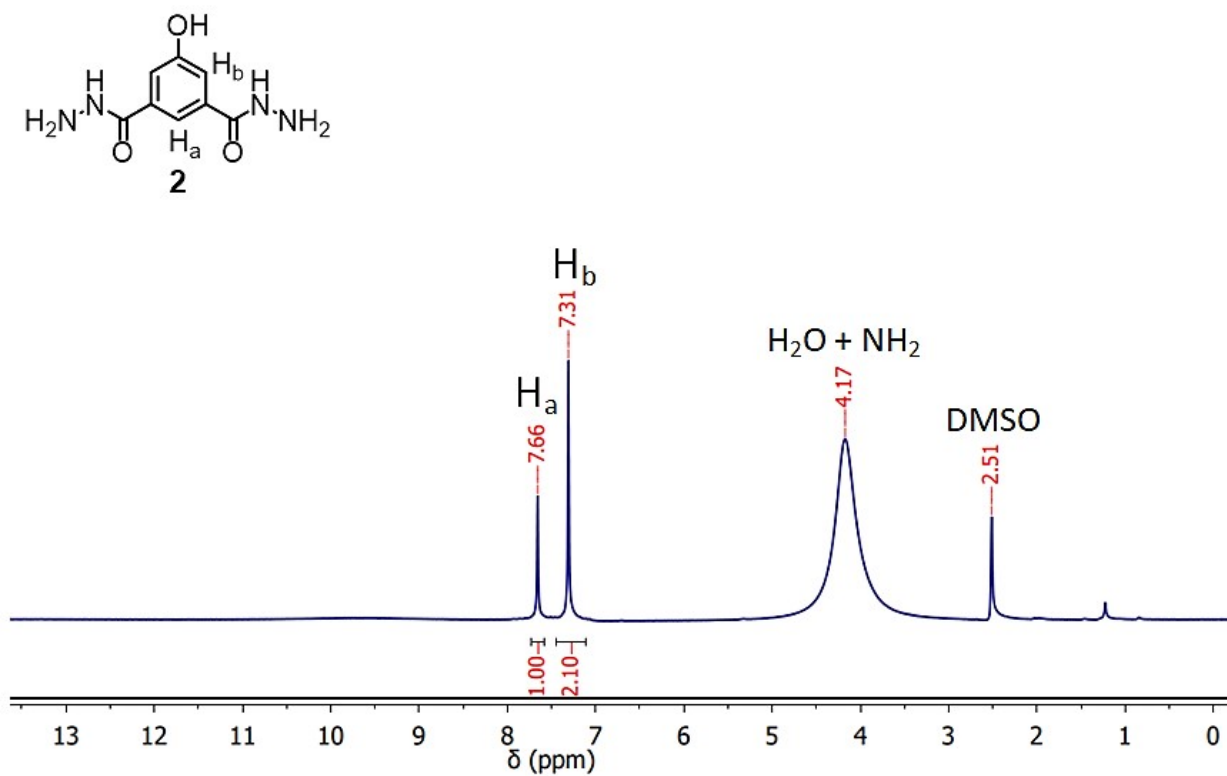
### **Synthesis of 5-hydroxyisophthalohydrazide 2<sup>[2]</sup>**

Dimethyl 5-hydroxyisophthalate (1 g, 4.76 mmol) was dissolved in 20 mL ethanol. Hydrazine hydrate (7.3 mL, 50 equiv.) was added and the reaction mixture was refluxed for 48 h. The precipitate was filtered, washed with ethanol, and dried to give 406 mg of a white powder.

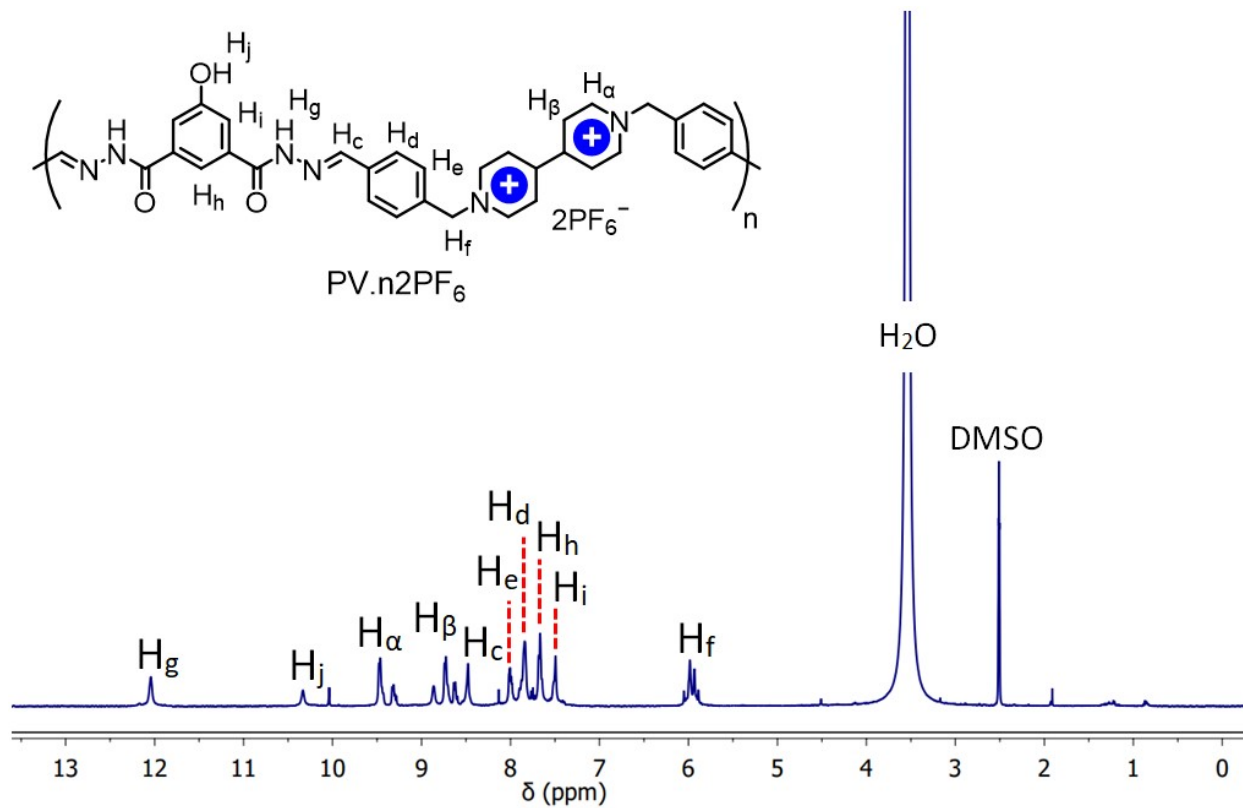


Figur

e S1. <sup>1</sup>H NMR spectrum of **1.2PF<sub>6</sub>** (400 MHz, DMSO-*d*<sub>6</sub>).

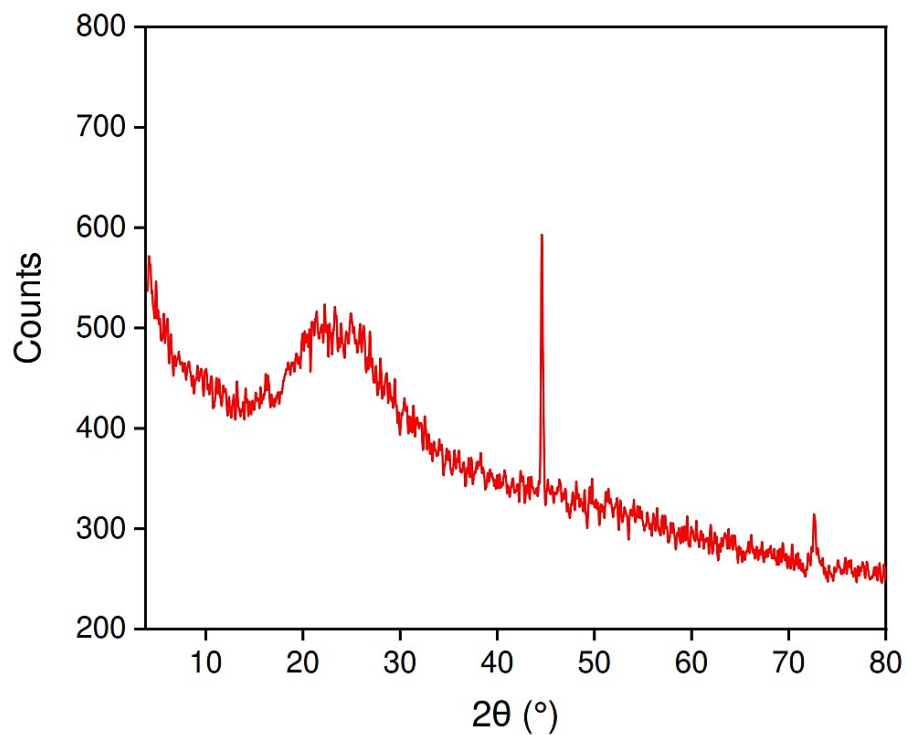


**Figure S2.**  $^1\text{H}$  NMR spectrum of dihydrazide **2** (400 MHz,  $\text{DMSO-}d_6$ ).

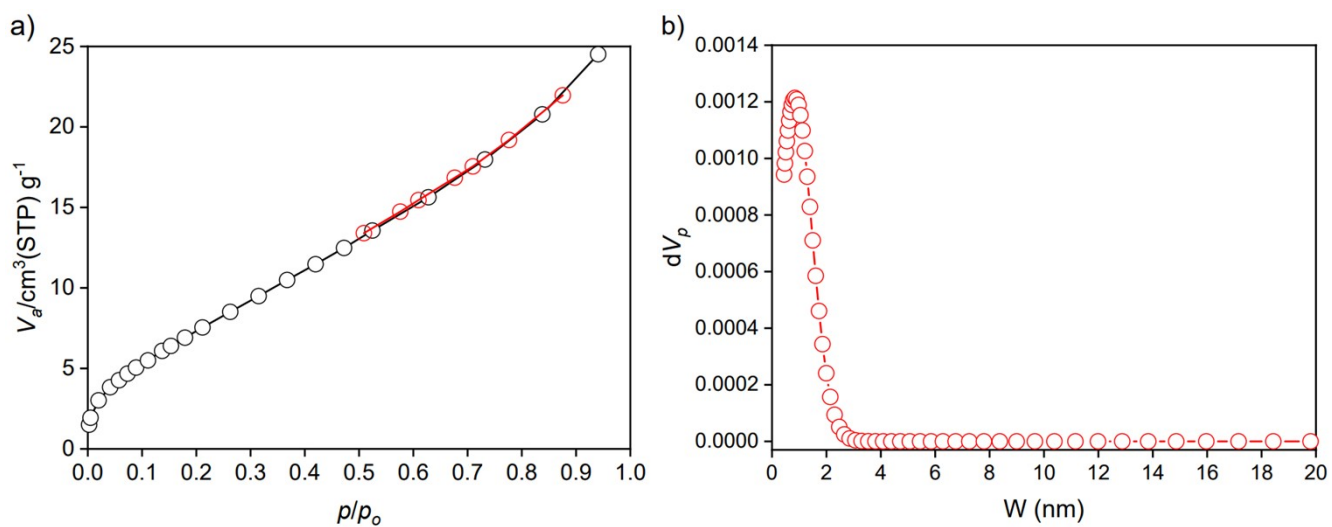


**Figur**

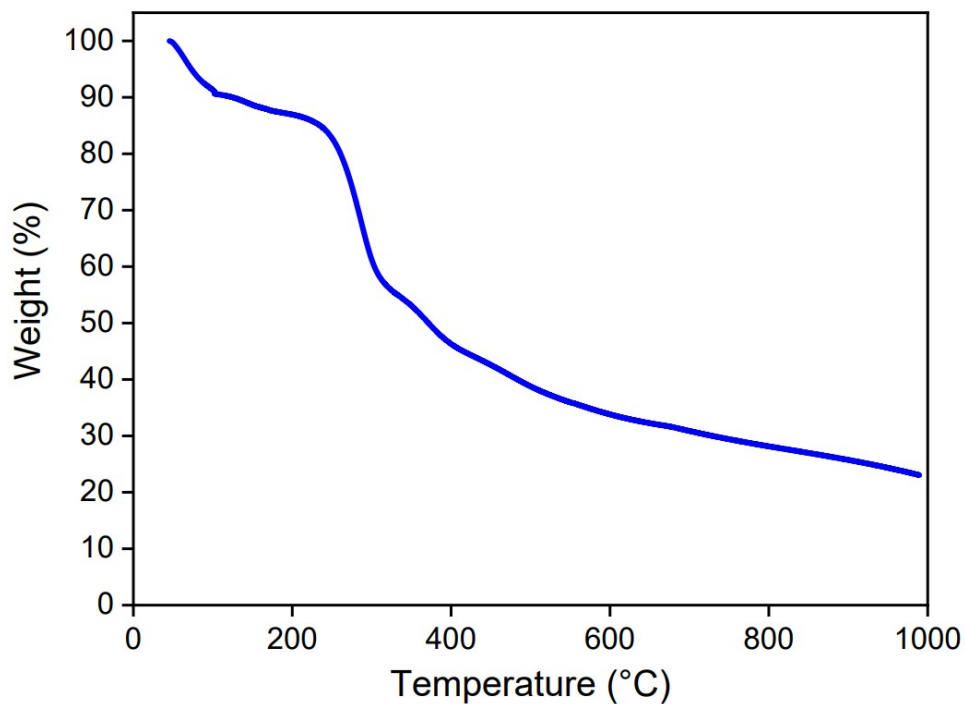
**e S3.**  $^1\text{H}$  NMR spectrum of  $\text{PV.n2PF}_6$  (400 MHz,  $\text{DMSO-}d_6$ ).



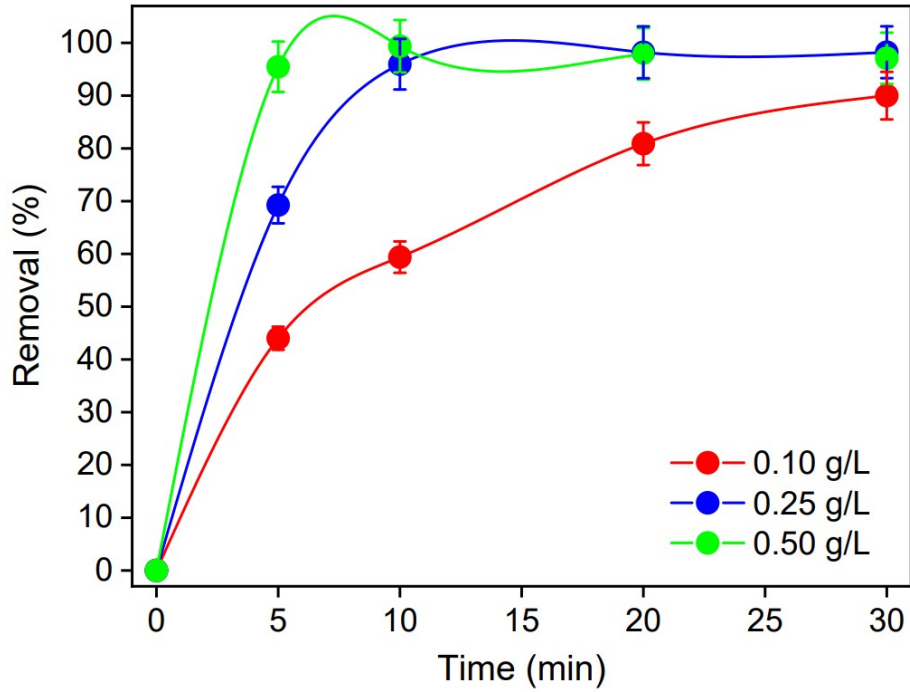
**Figure S4.** XRD of PV.n2Br adsorbent.



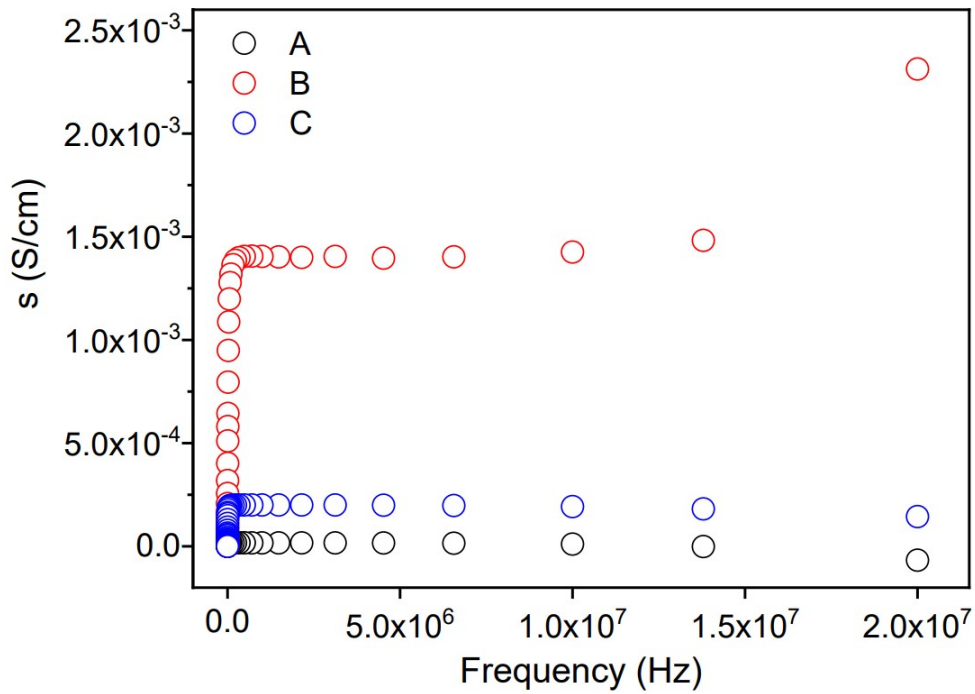
**Figure S5.**  $\text{N}_2$  adsorption-desorption isotherm and (b) NLDFT pore size distribution analysis of PV.n2Br.



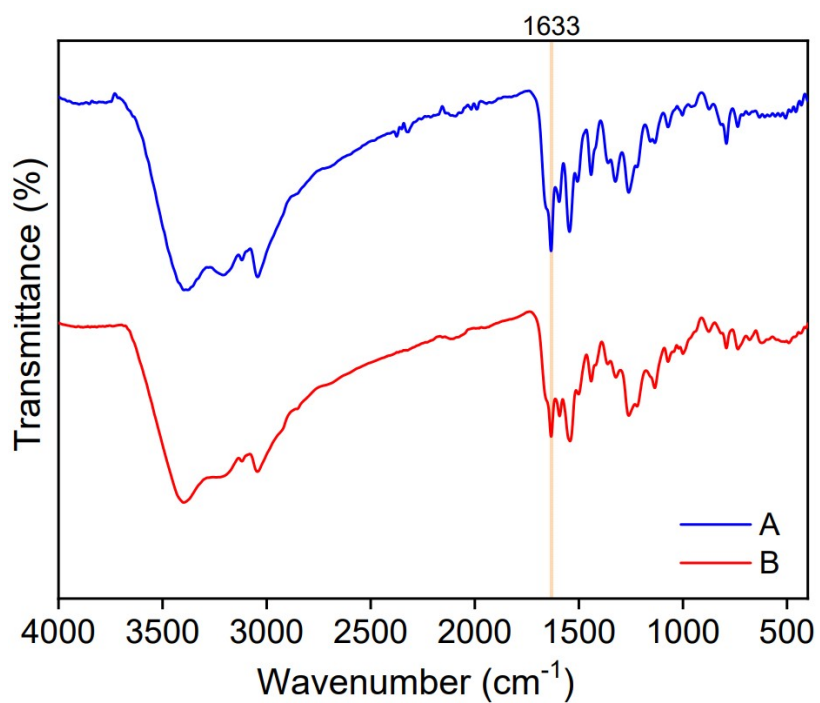
**Figure S6.** TGA of polyviologen aerogel adsorbent PV.n2Br.



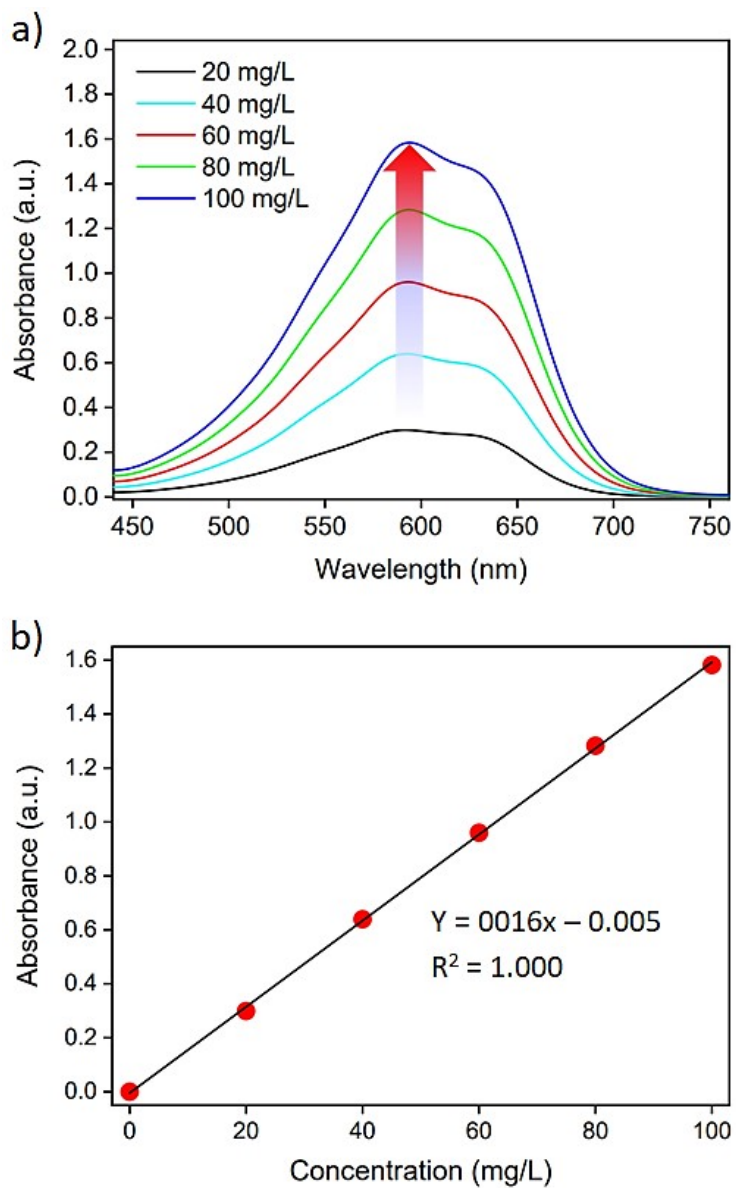
**Figure S7.** Effect of PV.n2Br concentration on the removal of RB19 at different contact time ( $pH_o = 3$ ,  $C_o = 20$  mg/L).



**Figure S8.** (A) Electrical conductivity of pure distilled water, (B) an aqueous solution of RB19, and (C) the aqueous filtrate generated after adsorption of RB19.



**Figure S9.** Stacked FTIR of PV.n2Br (A) before and (B) after the adsorption of RB19.



**Figure S10.** (a) UV-Vis absorption spectra of RB19 at different initial concentration and (b) calibration curve at 592 nm.



## References

1. K. Ciepluch, N. Katir, A. El Kadib, A. Felczak, K. Zawadzka, M. Weber, B. Klajnert, K. Lisowska, A.-M. Caminade, M. Bousmina, M. Bryszewska and J. P. Majoral, *Mol. Pharmaceutics*, 2012, **9**, 448–457.
2. J. Li, Y. Guo, H. Yao, Q. Lin, Y. Xie, T. Wei and Y. Zhang, *Chin. J. Chem.*, 2012, **31**, 271–276.