Supporting Information

Thermoresponsive fluorescence polymer brushes device as a platform for selective detection of Cr (VI)

Xudong Yang, Yingnan Jiang, Bowen Shen, Yang Chen, Fengxia Dong, Kui Yu, Bai Yang, and Quan Lin,*

*a State Key Laboratory of Supramolecular Structure and Materials, College of Chemistry, Jilin University, Changchun, 130012, P. R. China
Tel:+86-431-85168283; E-mails: linquan@jlu.edu.cn

b Lab of Polymer Composites Engineering, Changchun Institute of Applied Chemistry Chinese Academy of Sciences, 130022, P. R. China

c Steacie Institute for Molecular Sciences, National Research Council Canada, Ottawa, Ontario, K1A 0R6, Canada
Figure S1. The structure of tetraphenylethene derivate (d-TPE) was confirmed by $^1$H NMR spectroscopy in D$_2$O. The proton chemical shift at 7.21 ppm was assigned to the phenyl ring and the shift at 4.34 ppm could be attributed to the chemical shift of -CH$_2$- in 1-methoxy-4-methylbenzene. The proton chemical shift at 3.196 ppm was attributed to the -CH$_2$- in methylethanaminium bromide and the shift at 1.36 ppm assigned to the proton in methyl groups. All structures indicate the origin of monomer tetraphenylethene derivate d-TPE.
Figure S2. The PL excitation ($\lambda_{\text{ex}} \approx 340$ nm) and emission ($\lambda_{\text{em}} \approx 468$ nm) spectra of d-TPE molecules in aqueous solution.
Figure S3. The UV absorption spectra of d-TPE in aqueous solution (1×10⁻³ mol/L, 3 mL) before (solid line) and after (dotted line) interacting with the p(NIPAM-co-AAc) brushes film. The absorbance was 0.97270 and 0.95436, respectively. According to the Bouguer–Lambert–Beer law: 

$$A = \lg(1/T) = Kbc, \quad A_1/A_2 = C_1/C_2, \quad C_2 = 9.8114 \times 10^{-4} \text{ mol/L}, \quad C = C_1 - C_2 = 1.886 \times 10^{-5} \text{ mol/L},$$

the self-assemble amounts of d-TPE molecular on the brushes film was 1.886×10⁻⁵ mol/L×0.003 L=5.658×10⁻⁵ mmol.
Figure S4. The PL spectra ($\lambda_{ex} = 340$ nm) of d-TPE/p(NIPAM-co-AAc) brushes (blue line) and d-TPE molecules in aqueous solution ($1 \times 10^{-3}$ mol/L) (black line).
Figure S5. Normalized PL spectra of the d-TPE/p(NIPAM-co-AAc) brushes with the temperature increasing from 10 to 60 °C, and subsequently decreasing from 60 to 10 °C.
Figure S6. Normalized PL emission spectra of d-TPE/p(NIPAM-co-AAc) brushes at different temperatures (20, 40, and 60 °C) for four cycles. The PL intensity was obtained at ~468 nm with the excitation at 340 nm.
Figure S7. Normalized PL emission spectra of d-TPE/p(NIPAM-co-AAc) brushes in the presence of different ions (Cl, CO$_3^{2-}$, NO$_3^-$, SO$_3^{2-}$, SO$_4^{2-}$, ClO$_4^-$, Cr$^{3+}$ and CrO$_4^{2-}$) in aqueous solution at the same concentration of 50 ppm.