

Supporting Information for

Thermochromic Ion-Exchange Micelles Containing H⁺ Chromoionophores

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Supplementary Figures

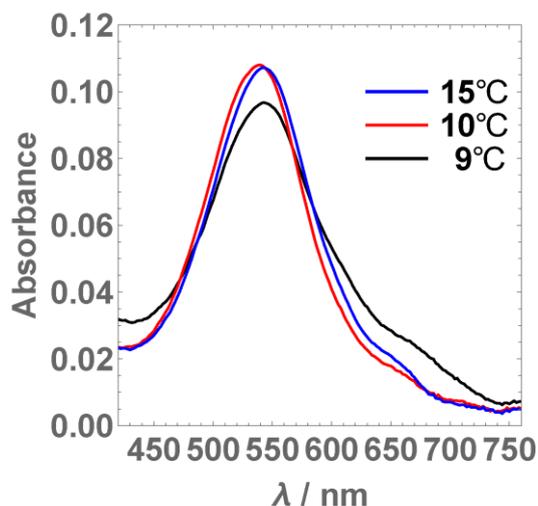


Figure S1. Absorption spectra of the 15% (w/w) F127 micelles containing chromoionophore I at 5 °C, 10 °C and 15 °C in pH 7.4 Tris-HCl buffer solution.

Figure S1 shows that without the ion-exchanger R^- , the absorption spectra for the chromoionophore doped micelles did not dramatically change at various temperature values. The spectrum at 5 °C indicates that the dyes may partly locate in the peripheral region of the micelles, where water molecules are abundant at low temperature and a small portion of the dyes becomes protonated. However, this relatively small spectrum intensity change (less than 5% at 665nm compared with that in the presence of R^- , Fig 2a) is overwhelmed in the presence of ion exchanger.

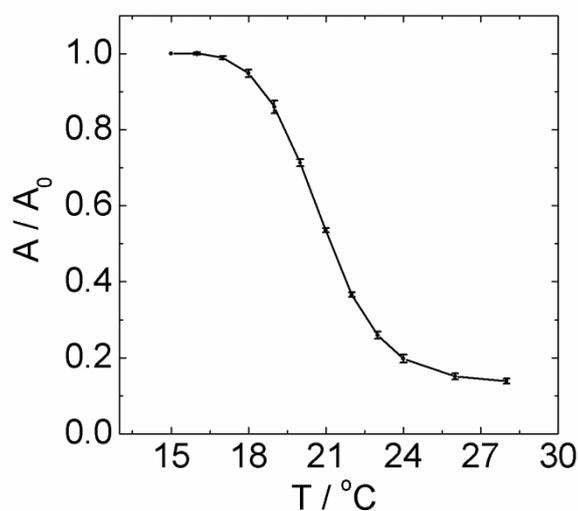


Figure S2. Plot of the normalized absorbance at 665 nm as a function of temperature for F127 (5 % w/w) micelles containing chromoionophore I and Na^+R^- in 2 mM Tris-HCl buffer at pH 7.0. Error bars showing the standard deviation from 3 measurements.

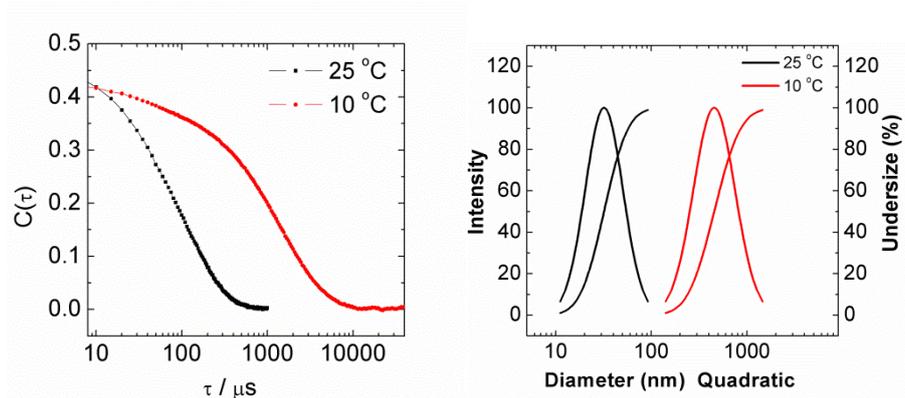


Figure S3. Normalized intensity autocorrelation function $C(\tau)$ (*left*) and normalized intensity based size distribution (*right*) from dynamic light scattering measurements for 5 % F127 micelles containing chromoionophore I and Na^+R^- at 10 and 25 °C, respectively. The sigmoidal curves in the right figure are cumulative (undersize) presentation for the size distributions.

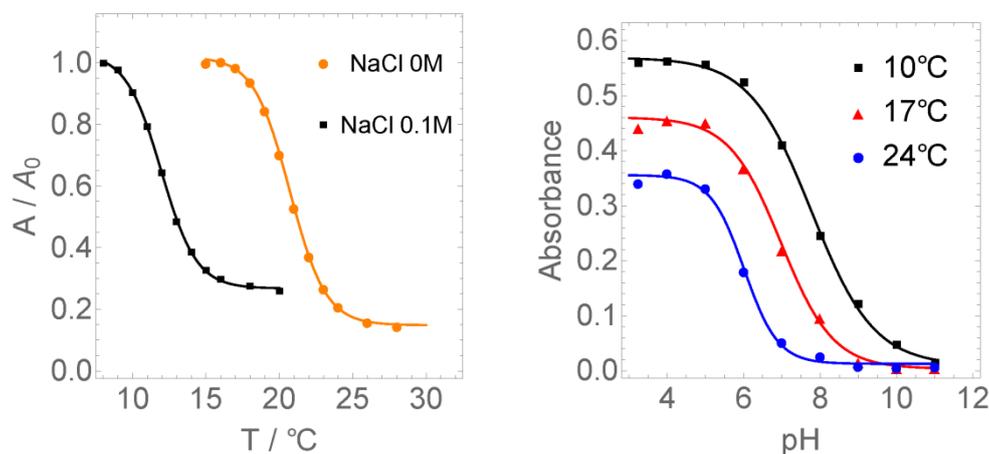


Figure S4. *Left:* Light absorbance at 665 nm of F127 (5% w/w) micelles containing chromoionophore I and Na^+R^- recorded at various temperatures in buffer solutions with and without addition of 0.1 M NaCl background. *Right:* Absorbance at 665 nm of F127 (5% w/w) micelles measured at 10, 17 and 24 °C at various pH values. Background: 2.5 mM universal pH buffer containing NaH_2PO_4 , citric acid and boric acid.

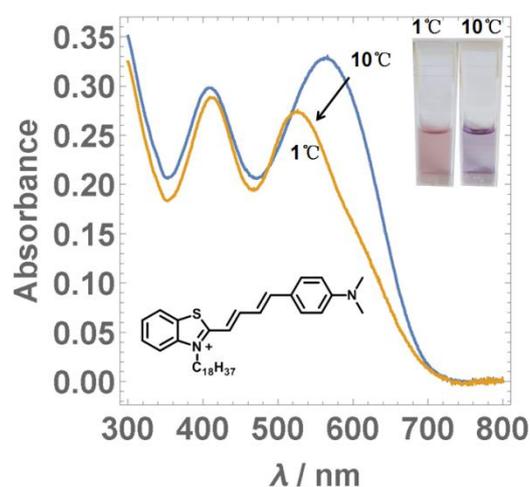


Figure S5. Absorption spectra of dye PSD doped F127 micelles (15% (w/w)) at 1 °C and 10 °C. Inset pictures are the appearance of the micelles in cuvettes at 1 °C (top left) and 10 °C (top right); and the chemical structure of dye PSD with iodide as the counter ion.

Figure S5 shows the absorption spectra of the PSD doped micelles at various temperature values. As the temperature decreased from 10 °C to 1 °C, the peak maximum around 580 nm showed a hypsochromic shift and the color of the solution went from violet to pink, indicating that the polarity of the micelle were gradually increasing. We attribute this polarity change to the hydration of the peripheral region of the micelles, since H₂O molecules are more polar than the poly(ethylene oxide) groups.



Figure S6. Pictures showing the color changes of chromoionophore I and NaTFPB mixture on a nylon filter paper under different conditions: (left): adding a drop of water; (right): after the water evaporated.

Figure S6 confirms that water (hydration) is an underlying factor for the ion exchange process and the following thermochromism. Following addition of H₂O on the filter paper, ion-exchange led to the formation of CH⁺, which showed a blue color. Removing water from the paper forced the deprotonation of CH⁺ and a recovery of the magenta color.