

Supporting Information

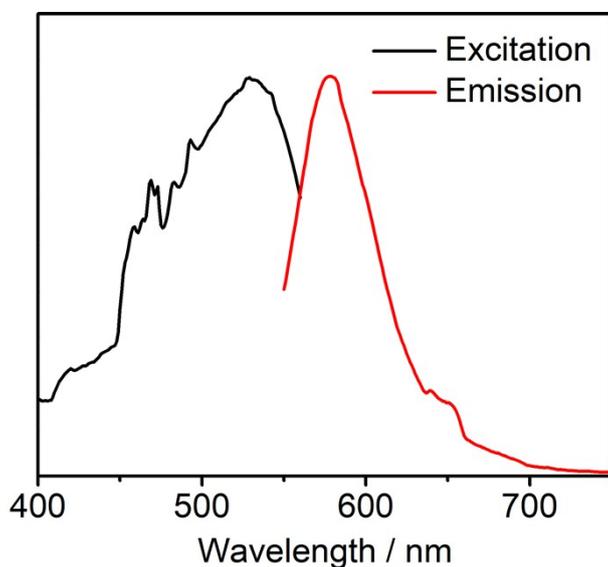


Fig. S1 Excitation and emission spectra of the SDII-KII-based ion-selective optode on the Nylon membrane.

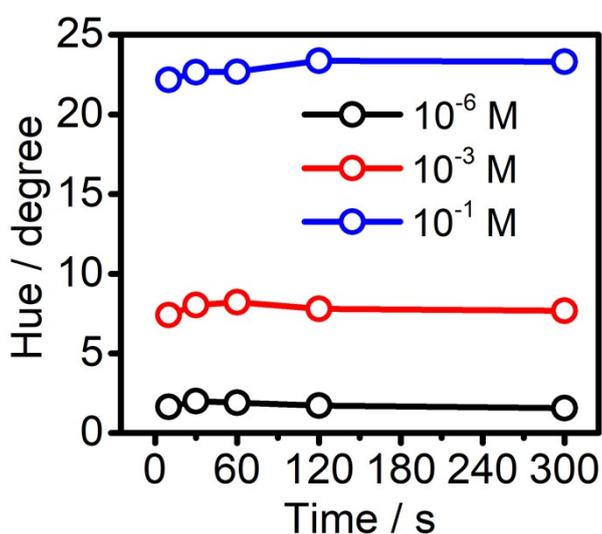
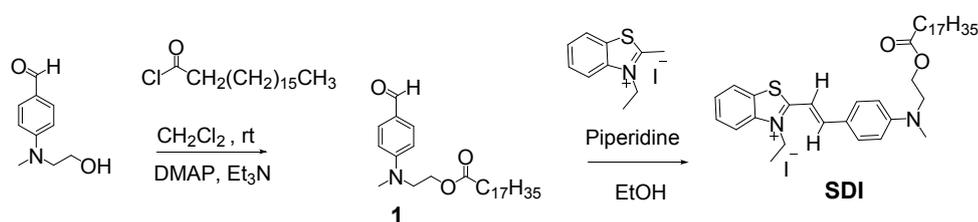


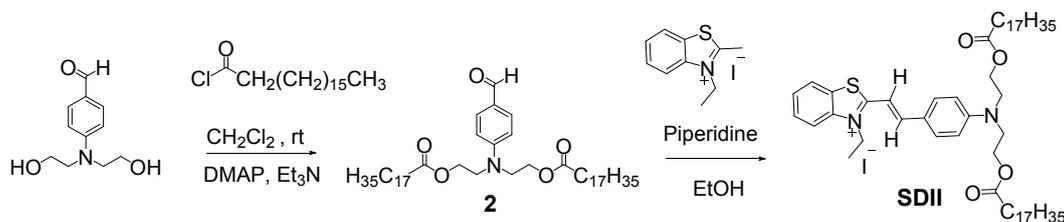
Fig. S2 Change in hue of the SDII-KII optodes over time after addition of 30 μL of aqueous samples onto the optode membrane. Although different optodes may have slightly different initial color due to errors in fabrication, a fast response time of about 30-60s is highly reproducible.

Synthesis of SD1 and SD2: All the chemicals were commercially available and used directly. Column chromatography was carried out using silica gel (60 Å, 60 - 230 μm) and ACS grade organic solvents (ethyl acetate, petroleum ether (boiling point range: 30 - 60 °C)). The synthetic compounds were characterized using ¹H NMR spectroscopy (Varian 400 MHz spectrometer). The solvatochromic dyes SDI and SDII were synthesized according to the pathways (1 and 2) in Scheme 1 with an adapted method of the procedure reported.¹

Pathway 1



Pathway 2



Scheme 1. The synthetic routes for solvatochromic dyes (SDI and SDII).

2-(4-Formylphenylmethylamino)ethyl stearate 1. To a solution of 4-((2-hydroxyethyl)methylamino)benzaldehyde (554.0 mg, 3.091 mmol), DMAP (5 mg) and anhydrous Et_3N (431.0 μL, $d=0.726$ g/mL, 3.092 mmol) completely dissolved in anhydrous CH_2Cl_2 (30 mL), was added stearoyl chloride (936.0 mg, 3.090 mmol) in anhydrous CH_2Cl_2 (5 mL) by dropwise. After overnight stirring for 16 h, the reaction solution was washed by water (3×100 mL). The organic layer was dried over by MgSO_4 and taken to dryness. The crude product was purified by column chromatography (silica gel/25:75 ethyl acetate-petroleum ether) to yield the title compound **1** as a yellow solid (1.25 g, 90%). ¹H NMR (400 MHz, CDCl_3): δ 9.75 (s, 1 H), 7.74 (d, $J = 9.2$ Hz, 2 H),

6.76 (d, $J = 9.2$ Hz, 2 H), 4.28 (t, $J = 6.0$ Hz, 2 H), 3.70 (t, $J = 6.0$ Hz, 2 H), 3.09 (s, 3 H), 2.24 (t, $J = 7.6$ Hz, 2 H), 1.30-1.24 (m, 30 H), 0.88 (t, $J = 6.8$ Hz, 3 H).

(*E*)-3-Ethyl-2-(4-methyl-2-stearoyloxyethylaminostyryl)benzo[d]thiazol-3-ium (SDI). To a solution of aldehyde **1** (500.0 mg, 1.122 mmol) and 3-ethyl-2-methylbenzothiazolium iodide (330.0 mg, 1.081 mmol) in EtOH (80 mL), was added piperidine (anhydrous, 20 μ L). The reaction solution was then refluxed over 2 days. After cooled back to room temperature, the solvent was taken to dryness. The resulting crude product was recrystallized in EtOH to yield a brown red solid as the title compound (400 mg, 45%). ^1H NMR (400 MHz, CDCl_3): 8.07 (d, $J = 8.8$ Hz, 2 H), 8.01 (d, $J = 7.6$ Hz, 1 H), 7.87 (d, $J = 4.4$ Hz, 2 H), 7.75 (d, $J = 8.4$ Hz, 1 H), 7.69 (td, $J = 6.8, 0.8$ Hz, 1 H), 7.59 (td, $J = 6.8, 0.8$ Hz, 1 H), 6.77 (d, $J = 9.2$ Hz, 2 H), 5.13 (q, $J = 7.2$ Hz, 2 H), 4.28 (t, $J = 6.0$ Hz, 2 H), 3.76-3.69 (m, 3 H), 3.11 (s, 3 H), 2.27 (t, $J = 7.6$ Hz, 2 H), 1.61 (t, $J = 7.2$ Hz, 2 H), 1.26-1.23 (m, 30 H), 0.88 (t, $J = 7.2$ Hz, 3 H).

(4-Formylphenylazanediyl)bisethane-2,1-diyl distearate 2. To a stirring solution of 4-[*N,N*-bis(2-hydroxyethyl)amino]benzaldehyde (500.83 mg, 2.3936 mmol) and DMAP (18 mg, 0.15 mmol) dissolved in anhydrous CH_2Cl_2 (55 mL), was added anhydrous Et_3N (700 μ L, $d = 0.726$ g/mL, 5.02 mmol). When aldehyde was completely dissolved, stearoyl chloride (1.520 g, 5.018 mmol) dissolved in anhydrous CH_2Cl_2 (5 mL) was slowly added into reaction solution by droplets in one portion. After stirring for 17 h, the reaction mixture was washed by water (3 \times 120 mL) and saturated brine (100 mL) again. After the drying over by MgSO_4 , all organic solvent was concentrated under vacuum to afford a yellow crude powder. This crude product was purified by column chromatography (silica gel/15:85 ethyl acetate-petroleum ether) to obtain the title compound as a yellow powder (1.58 g, 89%). ^1H NMR (400 MHz, CDCl_3): δ 9.76 (s, 1 H), 7.74 (d, $J = 8.8$ Hz, 2 H), 6.82 (d, $J = 8.8$ Hz, 2 H), 4.28 (t, $J = 6.0$ Hz, 4 H), 3.71 (t, $J = 6.0$ Hz, 4 H), 2.28 (t, $J = 7.6$ Hz, 4 H), 1.60-1.51 (m, 4

H), 1.25 (s, 56 H), 0.88 (t, $J = 6.0$ Hz, 6 H).

(E)-2-(4-(bis(2-(stearoyloxy)ethyl)amino)styryl)-3-ethylbenzo[d]thiazol-3-ium (SDII).

To a solution of 3-ethyl-2-methylbenzothiazolium iodide (287.84 mg, 0.9432 mmol) and aldehyde **2** (700.0 mg, 0.9432 mmol) in ethanol (anhydrous open in atmosphere, 60 mL) was added piperidine (anhydrous, 15 μ L). Then the reaction mixture was refluxed for 2 days. After the reaction mixture cooled to room temperature, a brown red precipitate was obtained. This crude product was recrystallized in EtOH to yield a brown red solid as the title compound (210 mg, 22%). ^1H NMR (400 MHz, CDCl_3): δ 8.07 (d, $J = 8.8$ Hz, 2 H), 8.01 (d, $J = 8.0$ Hz, 1 H), 7.96 (d, $J = 15.2$ Hz, 1 H), 7.83 (d, $J = 16.4$ Hz, 1 H), 7.80 (d, $J = 9.2$ Hz, 1 H), 7.72 (t, $J = 7.2$ Hz, 1 H), 7.62 (t, $J = 7.2$ Hz, 1 H), 6.86 (d, $J = 8.8$ Hz, 2 H), 5.17 (q, $J = 7.6$ Hz, 2 H), 4.28 (t, $J = 6.4$ Hz, 4 H), 3.74 (t, $J = 6.4$ Hz, 4 H), 2.31 (t, $J = 7.6$ Hz, 4 H), 1.65-1.58 (m, 7 H), 1.24 (s, 56 H), 0.88 (t, $J = 6.0$ Hz, 6 H).

Reference

1. X. Xie, I. Szilagyi, J. Zhai, L. Wang and E. Bakker, *ACS Sens.*, 2016, **1**, 516-520.

NMR spectra

