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Supporting Information

1. The synthesis of HPOAA

HPOAA was prepared in laboratory scale via Williamson reaction and the synthetic routes were as following: (1) (2,6-dimethylheptyl) phenol sodium was prepared by adding 0.2 mole metallic sodium to the 0.2 mole (2,6-dimethylheptyl) phenol in alcohol media and followed by stirring for 1 h at room temperature. (2) 0.2 mole sodium chloroacetate solution was added dropwise to the previous phenol sodium solution at 110°C and the reactant was stirred for 1 h. (3) The resultant solution was sequentially neutralized with 6 mol/L HCl, extracted with diethyl ether, washed with deionized water, and evaporated on a rotary evaporator until dry. (4) HPOAA was purified further by vacuum distillation at 160-180°C.

Yield 76 %. Purity 99% (acid-base titration method). ^{1}H NMR (500 MHz, $CDCl_3$) δ 0.55-0.95(m, 8H), 1.00-1.40 (m, 8H), 1.40-1.85 (m, 3H), 5.02 (s, 2H), 6.87-6.89 (d, *J* = 7.6 Hz, 2H), 7.25-7.27 (d, *J* = 7.5 Hz, 2H), 8.13 (b, 1H); ^{13}C NMR (500 MHz, $CDCl_3$) δ 19.9, 22.6, 24.5, 28.7, 35.7, 36.5, 40.5, 43.9, 65.0, 114.1, 128.0, 142.2, 155.0, 171.4.

2. The synthesis of $[N_{1888}][POAA]$

$[N_{1888}][POAA]$ was prepared by acid-base neutralization method. (1) 80.8 g of $[N_{1888}]Cl$, 8.0g NaOH and 55.7 g of HPOAA were added to 100 mL of methanol. (2) This mixture was stirred for 1 h at 70 °C. (3) NaCl generated was filtered and the remained mixture was washed 4 times with water. (4) The product was rotary-evaporated at 75 °C for 0.5 h and vacuum dried at 110 °C for 12 h.

Yield 98%. ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.21-7.17 (m, 2H), 6.88-6.83 (m, 2H), 4.42 (s, 2H), 3.37-3.24 (m, 6H), 3.19 (s, 3H), 1.67 (d, *J* = 7.0 Hz, 2H), 1.61 (d, *J* = 6.9 Hz, 6H), 1.41-1.15 (m, 38H), 0.88 (t, *J* = 7.0 Hz, 9H), 0.71 (s, 11H). ^{13}C NMR (500 MHz, $CDCl_3$) *δ* 173.4, 156.8, 141.4, 126.7, 126.6, 115.0, 114.0, 68.1, 61.2, 57.0, 48.7, 31.8, 31.7, 31.6, 29.1, 29.0, 26.3, 22.6, 22.3, 14.0.

3. The effect of stirring speed on the thickness of the interfacial layer and average velocity

The effect can be deduced from the following equation (Z. Zheng, J. Lu, D. Q. Li and G. X. Ma, *Chem. Eng. Sci.*, 1998, **53**, 2327-2333).

$$\delta = \sqrt{\frac{1}{2}(9H^2 - \sqrt{81H^4 - 96LD_iH^2/U})} \qquad (8)$$

Where δ is thickness of the interfacial layer (cm), *H* is thickness of the channel (cm), *L* is length of contacting interfacial area (cm), D_i is diffusivity (cm2/s), *U* is average velocity (cm/s).

Fig.S1 The effect of stirring speed on δ and *U*. *H* =0.4 cm, *L*=4 cm, D_i =6.76E-07cm^2/s