Electronic Supplementary Information

Vesicles formation of single-chain amphiphile 4-dodecylbenzene sulfonic acid in water and micelle-to-vesicle transition induced by wet-dry cycles

Meihua Gao, [a] Na Du,* [a] Zhiyin Yao, [a] Ying Li, [a] Nan Chen, [a] Wanguo Hou* [a,b]

[a] Key Laboratory of Colloid & Interface Chemistry (Ministry of Education), Shandong University, Jinan, 250100, China.

[b] National Engineering Technology Research Center of Colloidal Materials, Shandong University, Jinan 250100, P.R. China.

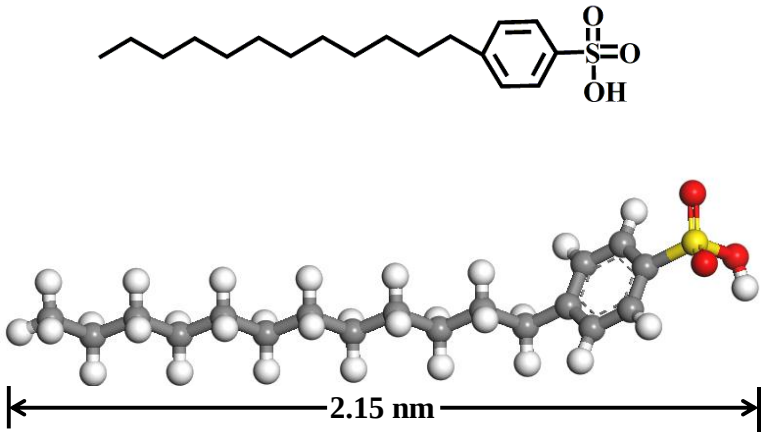

Fig. S1 Chemical structure of DBSA. The energy-minimized structure of DBSA was obtained via the density functional theory by Gaussian 9.0. The atom coloring scheme is C, gray; H, white; S, yellow; O, red.

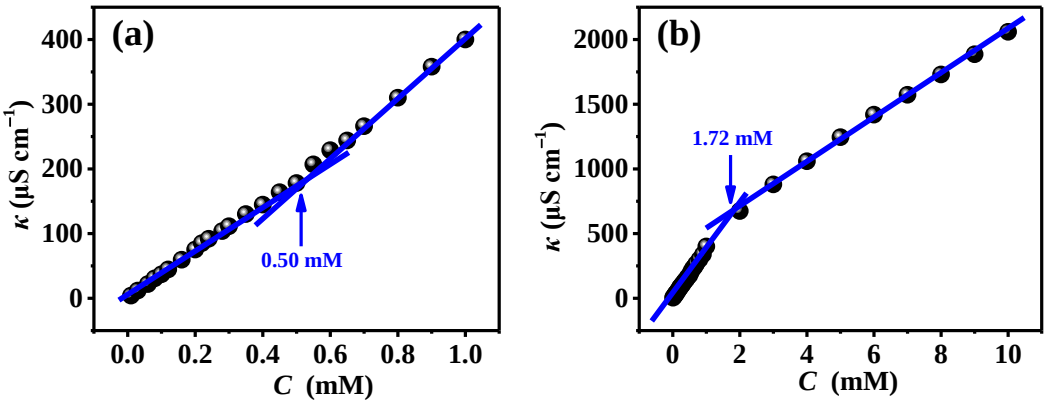

Fig. S2 Conductivity (κ) versus concentration (C) for DBSA solutions at 25.0 °C. Two breakpoints are observed at ~0.50 and 1.72 mM, corresponding to the first and second CACs.

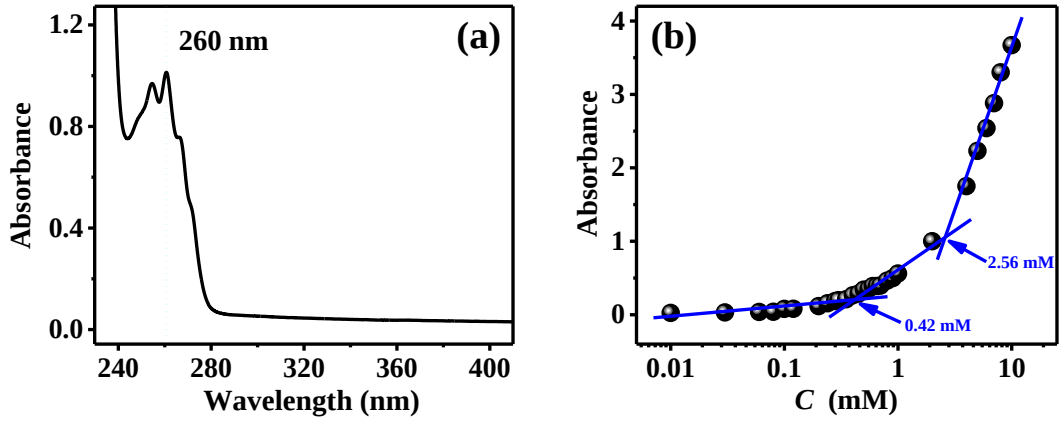

Fig. S3 (a) UV-vis spectrum of 2 mM DBSA solution, showing a maximum absorption at 260 nm. (b) Absorbance (at 260 nm) of DBSA solution as a function of concentration, showing two breakpoints at ~0.42 and 2.56 mM.

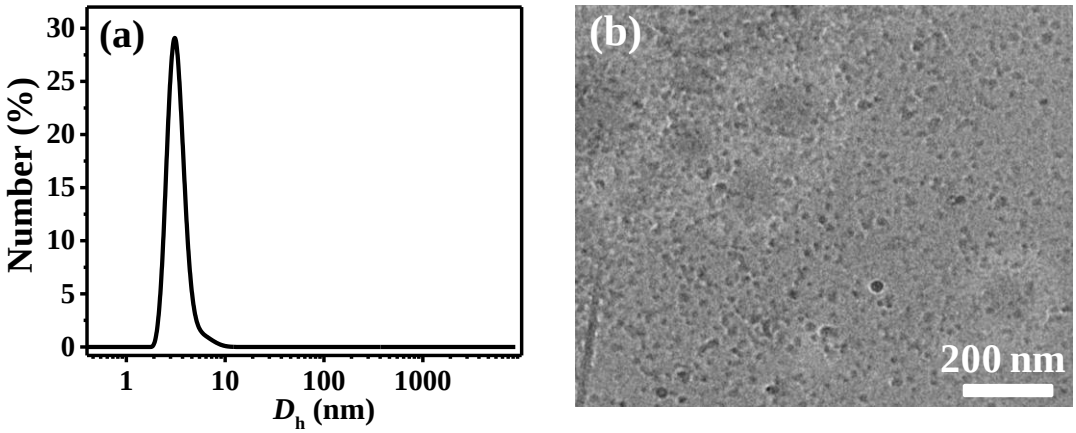

Fig. S4 (a) Number-weighted size distribution and (b) cryo-TEM image of 1 mM DBSA solution.

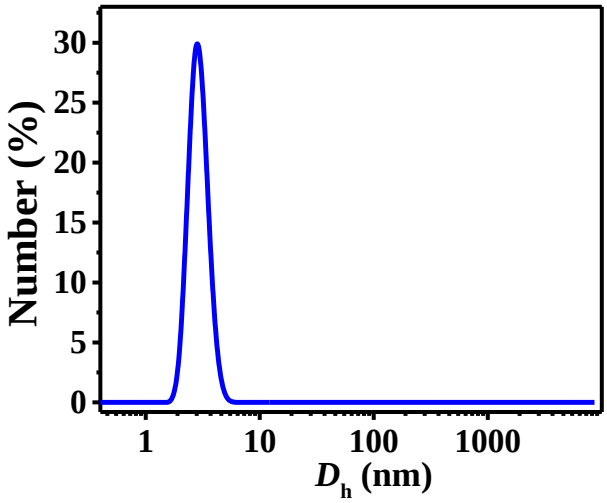

Fig. S5 Number-weighted size distribution of 10 mM DBSA solution.

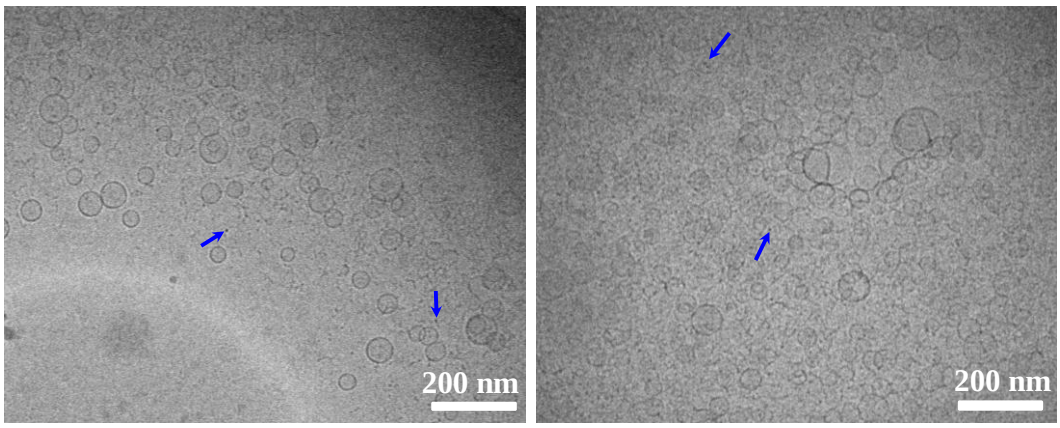

Fig. S6 Cryo-TEM images of 10 mM DBSA solution. Blue arrows indicate some spherical micelles.

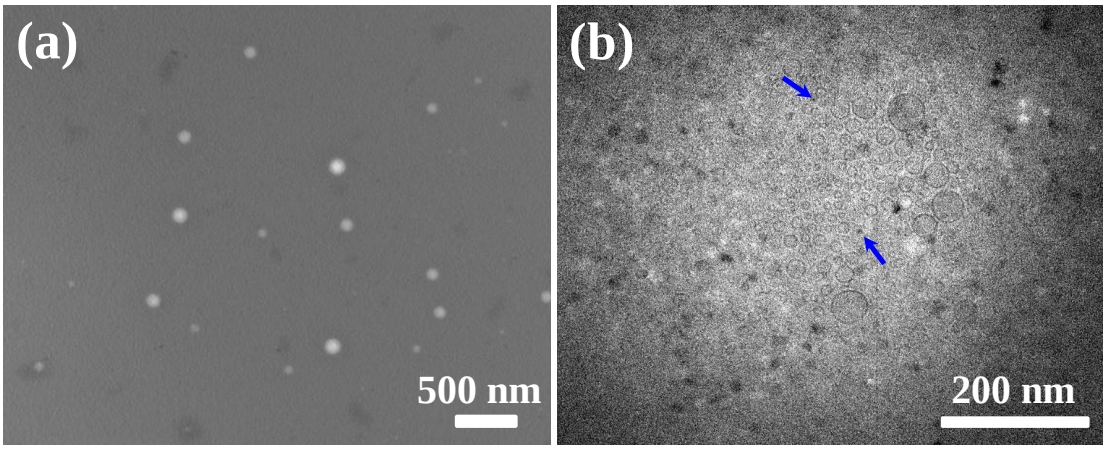

Fig. S7 (a) NS-TEM and (b) cryo-TEM images of 100 mM DBSA solution. Blue arrows indicate some spherical micelles.

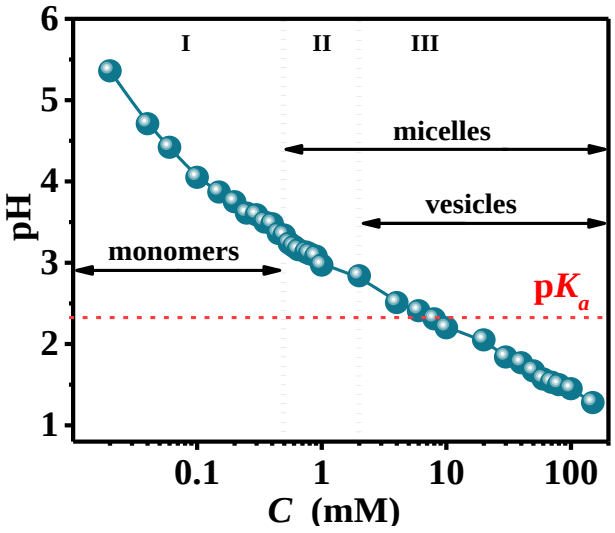

Fig. S8 Change of pH of DBSA solution with its concentration at 25.0 °C. The Regions I, II, and III correspond to monomer, micelle, and micelle/vesicle phases, respectively. DBSA vesicles form in the pH range nearby its apparent pK_a (pH ~2.31).

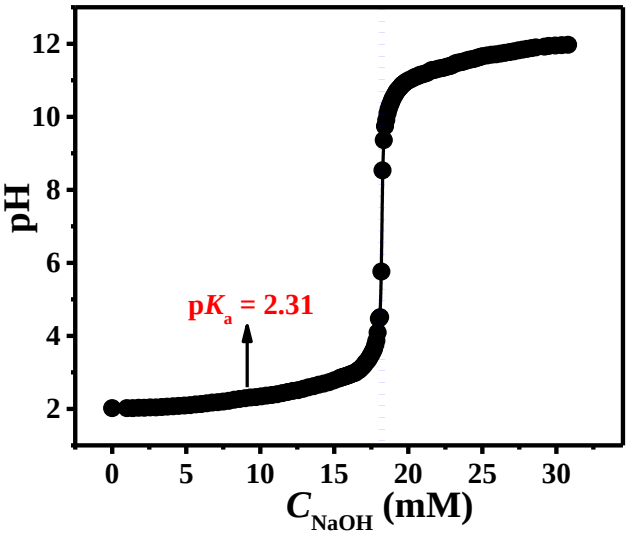

Fig. S9 pH titration curve of DBSA solution (20 mM) at 25.0 °C. The inflection points of pH titration curves are commonly thought to correspond to the complete ionization of acidic surfactants, and the pH values at half the ionization volume are defined as the apparent pK_a of the surfactant.

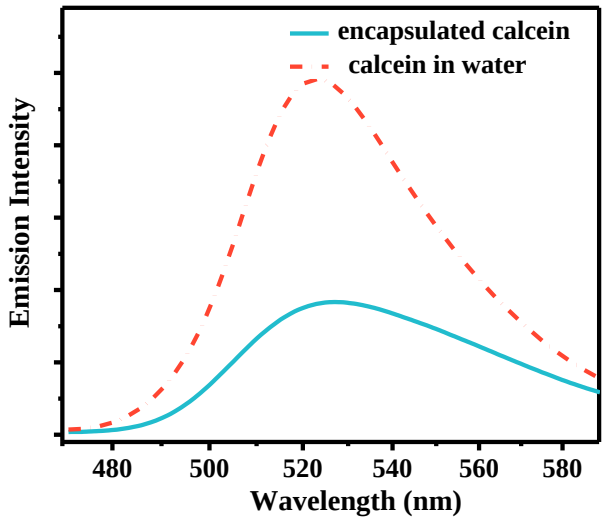

Fig. S10 Emission spectra of calcein-marked DBSA vesicle solution (solid line) and absorbance-normalized caclcein solution (dotted line).

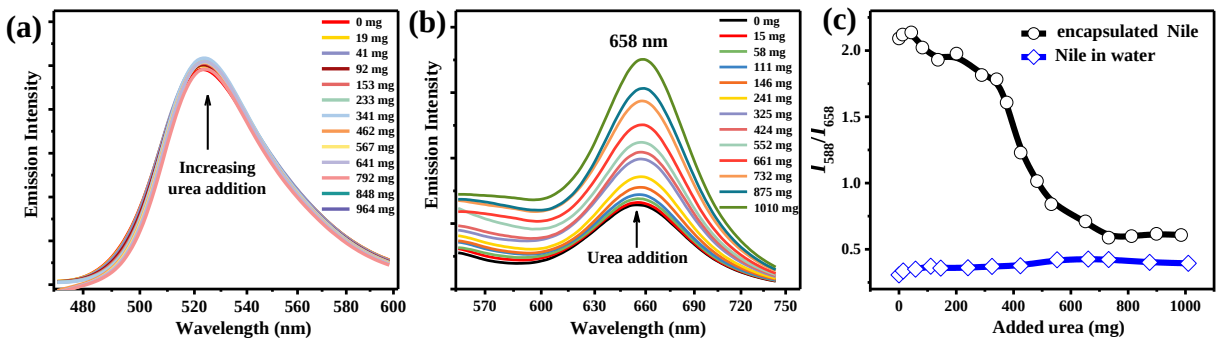

Fig. S11 Effect of urea addition on the emission spectra of aqueous solution of (a) free calcein and (b) free Nile red in pure water. (c) Change of I_{588}/I_{658} with urea dosages for Nile red-marked DBSA vesicle solution and Nile red aqueous solution.

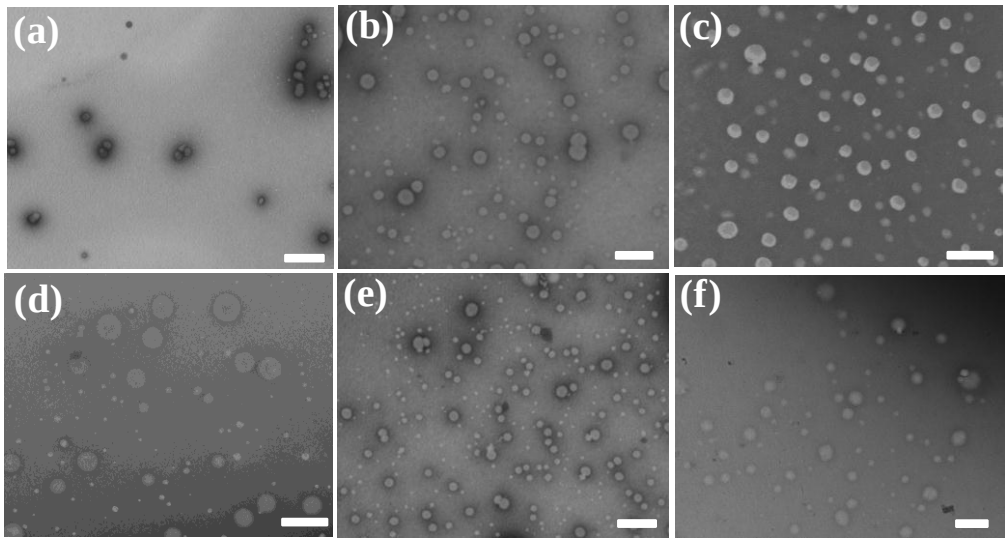

Fig. S12 NS-TEM images of 10 mM DBSA vesicle solution after (a) storage at room temperature for two years, (b–e) exposure to (b) 40, (c) 60, (d) 70, and (e) 80 °C for 2 h, and (d) freeze (–20 °C for 2 h)-thawing (25.0 °C) cycle. All scale bars: 500 nm.

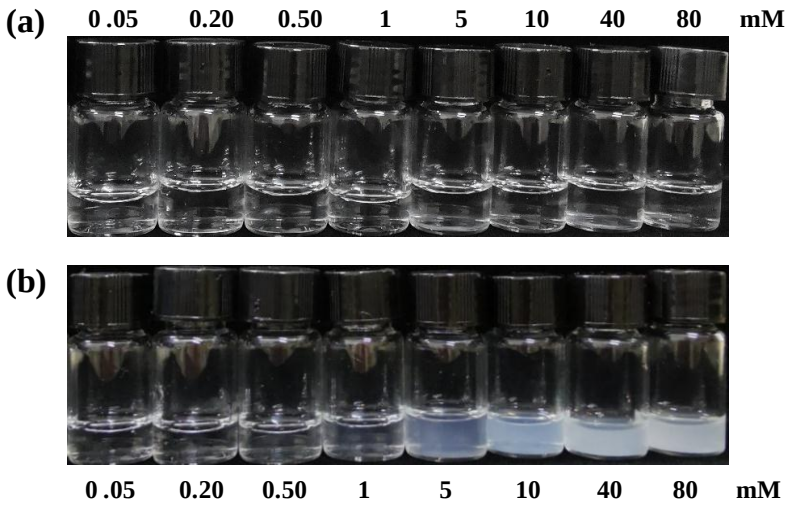

Fig. S13 The appearance photographs of DBSA solution with different concentrations (a) before and (b) after the wet-dry cycle.

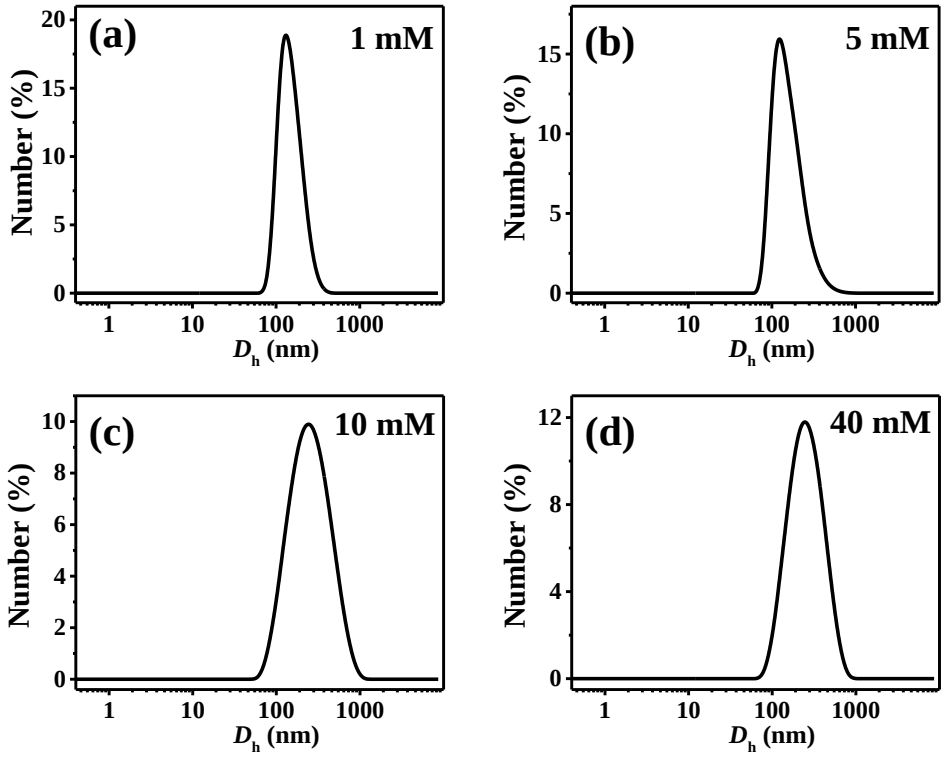

Fig. S14 Number-weighted size distributions of DBSA solutions with (a) 1, (b) 5, (c) 10, and (d) 40 mM after the wet-dry cycle at 25.0 °C.

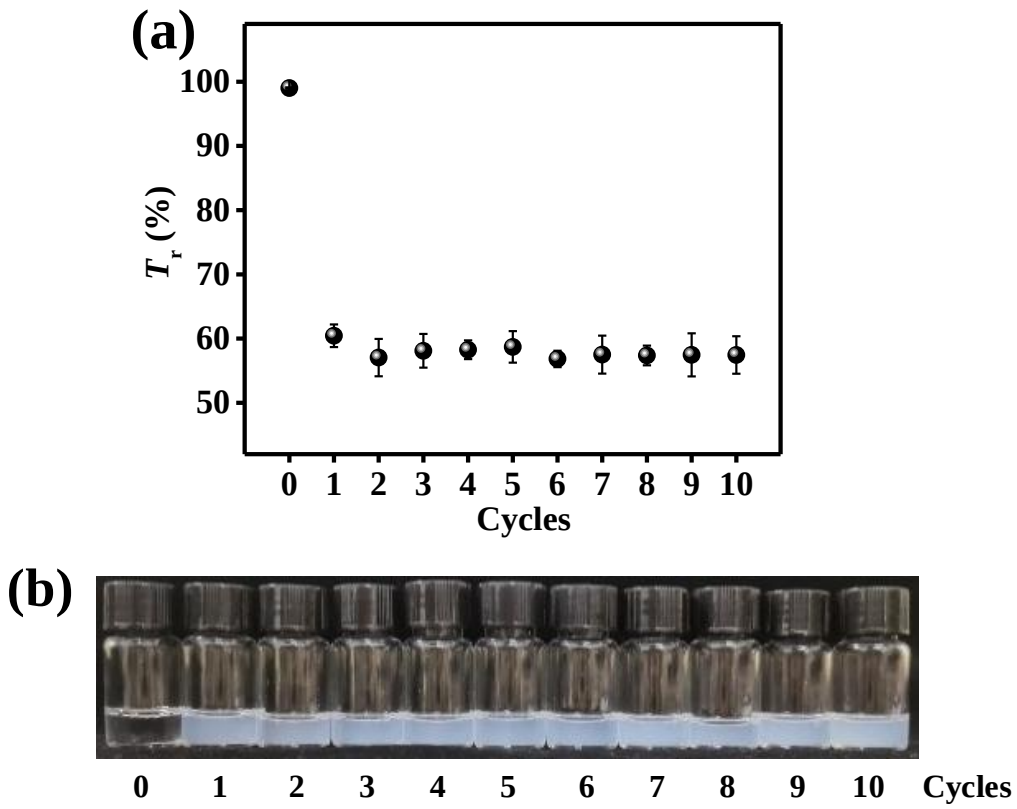

Fig.S15 Change of (a) transmittance and (b) appearance of 10 mM DBSA solution with the number of wet-dry cycles at 25.0 °C.