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Electronic Supplementary Information (ESI)

Fabrication of robust Ag nanoparticles anchored mesh for oil

removal and in situ catalytic reduction of aromatic dyes

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Fig. S1 Profile image of PDA pre-coated SSM.



Fig. S2 FT-IR spectra of the papillaes on the SSM surface.

The peak at 1408 cm⁻¹ was ascribed to the C-C vibration of the benzene ring moiety. The peaks at 1539 cm⁻¹ and 1300 cm⁻¹ corresponded to the N-H shearing vibration of the amide group and the stretching vibration of phenolic C-OH group, respectively, indicating the successful polymerization of dopamine and the presence of PDA layer on the SSM surface.



Fig. S3 FESEM images of the Ag NPs anchored SSMs obtained at different $AgNO_3$ concentration, voltage and reaction time.

In the electro-deposition process, the content and structure of Ag NPs showed the tendency of first increase and then reduction with increasing the AgNO₃ concentration, voltage and prolonging reaction time. (Fig. S3⁺) When fixing the voltage at 1.5 V and the reaction time for 60 s twice, a sparse layer of Ag NPs deposited on PDA pre-coated SSM surface during AgNO₃ concentration in 0.002 M (Fig. S3a⁺). When increasing the concentration to 0.010 M, the loading content is, nevertheless, lower than that of obtained at 0.005 M AgNO₃ concentration. Besides, the sizes of Ag NPs that constituted of microscale clusters were much larger than that of obtained at 0.005 M AgNO₃ concentration, which greatly decreased the specific surface area (Fig. S3b⁺, Fig. 1e and f). Similarly, whether fixing the AgNO₃ concentration in 0.005 M and the reaction time for 60 s twice, but changing the voltage in different values (0.75 V, 1.5 V and 3.0 V), or fixing the AgNO₃ concentration in 0.005 M and the voltage at 1.5 V, but changing the reaction time for 30 s, 60 s and 90 s twice, the content and structure of Ag NPs also showed the same tendency as the above (Fig. S3c-f⁺). These results demonstrated that the morphology of Ag NPs could be controlled by tuning the AgNO₃ concentration, voltage and reaction time. Compared with the different morphologies produced in sundry reaction conditions, a AgNO₃ concentration in 0.005 M, voltage at 1.5 V and a reaction time for 60 s twice were selected as the optimal fabrication conditions for the effective oil removal and catalytic reduction of aromatic dyes.



Fig. S4 FESEM images of Ag NPs decorated on pristine SSM via one-step electro-deposition process with low and enlarged magnifications.



Fig. S5 FESEM images of (a and b) Ag NPs deposited on pristine SSM and (c and d) Ag NPs clusters on pre-coated SSM with low and enlarged magnifications after powerful sonication for 2 h.



Fig. S6 (a) Separation procedure of toluene (dyed with Oil Red O) and water mixture, where water permeated through the as-obtained mesh whilst toluene was obstructed on the upper tube. (b) Separation efficiency and the corresponding permeation flux of the Ag NPs anchored SSM for a range of oil/water mixtures.



Fig. S7 N-octane/water separation performance of I) freshly prepared Ag NPs anchored SSM, II) Ag NPs anchored SSM after being stored under moist condition at 45 °C for 5 days, and III) Ag NPs anchored SSM after powerful sonication for 2 h.



Fig. S8 (a) pH's influence on Ag NPs anchored SSM in oil removal behavior towards the mixture of n-octane and aqueous solution with different pH values. (b) Volume ratio's influence on Ag NPs anchored SSM in oil behavior towards the mixture of n-octane and water in different ratio.



Fig. S9 FESEM images of (a and b) Ag NPs anchored SSM before and after one time separating the mixture of n-octane and aqueous solution (pH = 3).



Methylene blue



Rhodamine B



Fig. S10 Molecular structures of four kinds of dyes.



Fig. S11 UV-vis spectra for catalytic reduction of (a) MB, (b) RB, (c) CR and (d) AB aqueous solutions by the Ag NPs anchored SSM in the presence of NaBH₄ and without adding the resultant mesh as comparison. Insets: the corresponding color variation of aqueous dye solutions after reacting for 30 min.



Fig. S12 Catalytic efficiency of NaBH₄ and the composite combining the Ag NPs anchored SSM with NaBH₄ towards four kinds of aromatic dyes.



Fig. S13 UV-vis spectra and the catalytic efficiency for reduction of MB aqueous solution by the PDA pre-coated SSM in the presence of NaBH₄. Inset: the corresponding color variation of aqueous dye solution after reacting for 30 min.



Fig. S14 Catalytic performance of I) freshly prepared Ag NPs anchored SSM, II) Ag NPs anchored SSM after being stored under moist condition at 45 °C for 5 days, and III) Ag NPs anchored SSM after powerful sonication for 2 h.

Reference:

S1. M. Cheryan and N. Rajagopalan, J. Membr. Sci., 1998, 151, 13.