Electronic Supplementary Information

Mussel-Inspired Chemistry and Stöber Method for Highly Stabilized Water-in-Oil Emulsions Separation

Yingze Cao, Yuning Chen, Na Liu, Xin Lin, Lin Feng*, and Yen Wei

Chemiscals

Dopamine hydrochloride (Sangon Biotech Co. Ltd., Shanghai, China) and 3-aminopropyltriethoxysilane and n-dodecyltrimethoxysilane (J&K Scientific Ltd. China) were used as purchased. Other reagents from Sinopharm Chemical Reagents are of analytical grade and used without further purification.

Supplementary Data

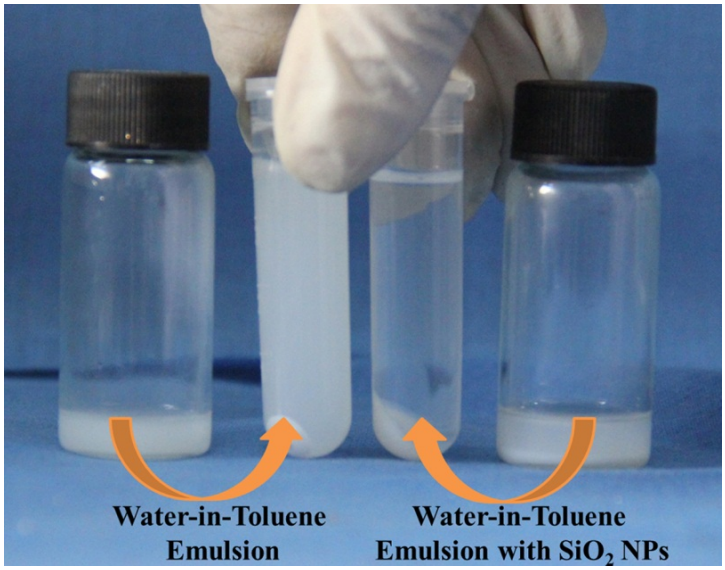

Fig. S1. The demulsification of the as-prepared SiO_2 nanoparticles: samples have been centrifuged at a moderate speed for 3 min owing to the size of the SiO_2 nanoparticles. It clearly presents the demulsification of the functional SiO_2 nanoparticles.

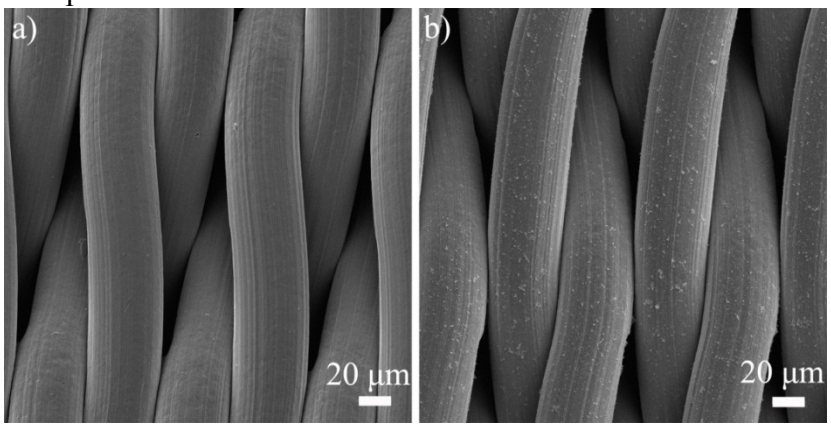

Fig. S2. a) SEM image of the uncoated mesh shows a smooth and clear surface and b) SEM image of polydopamine coated mesh with uniformly nano-scale particles.

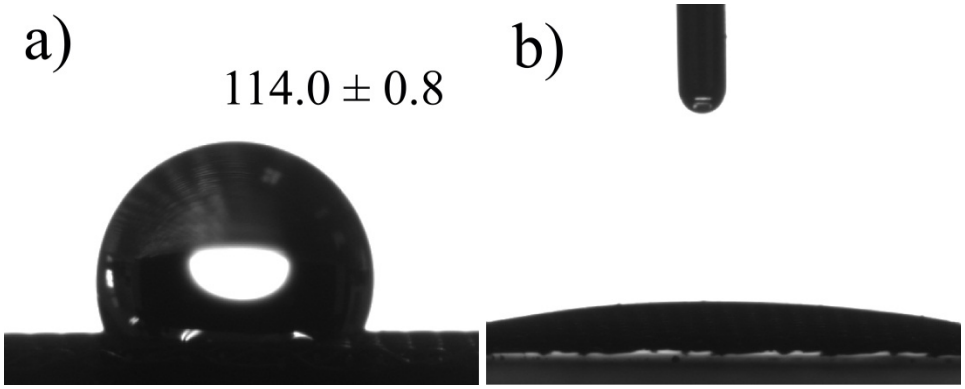

Fig. S3. a) the photograph of a water droplet (2 μL) on the stainless steel mesh with a contact angle of 114.0 ± 0.8 °; b) a water droplet (2 μL) spread and permeate quickly on the polydopamine coated mesh.

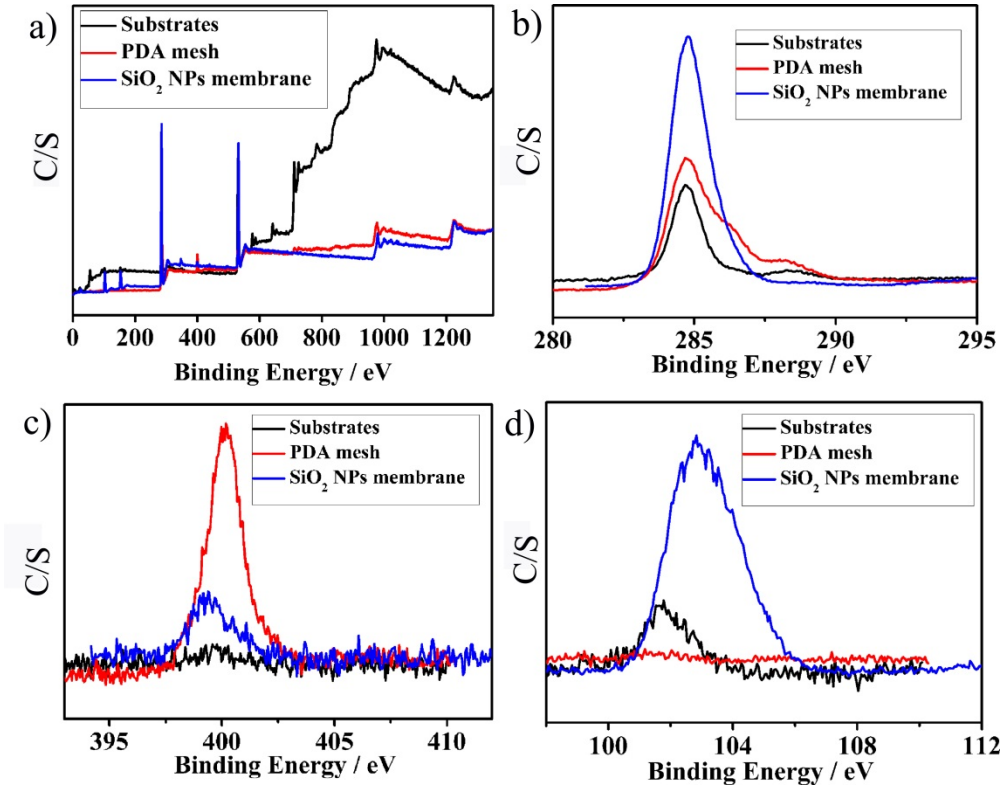

Fig. S4. XPS spectra of the as-prepared mesh: a) survey scans the spectral region from 0 to 1350 eV; b-d) high-resolution XPS C1s, N1s, and Si2p narrow scans as a function of electron binding energy (BE): the content of C gradually increased after each step; the increase of N content after dopamine self-polymerization and decrease after SiO_2 nanoparticles modification; silicon element was markedly increased on the SiO_2 nanoparticles coated membrane.

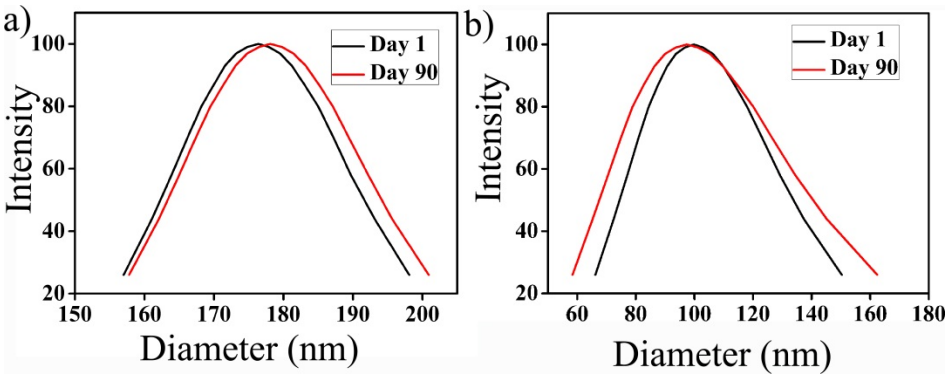

Fig. S5. Dynamic light scattering (DLS) graphs of water-in-chloroform and water-in-gasoline emulsions on day 1 and 90 as examples with the droplets sizes less than 200 nm.

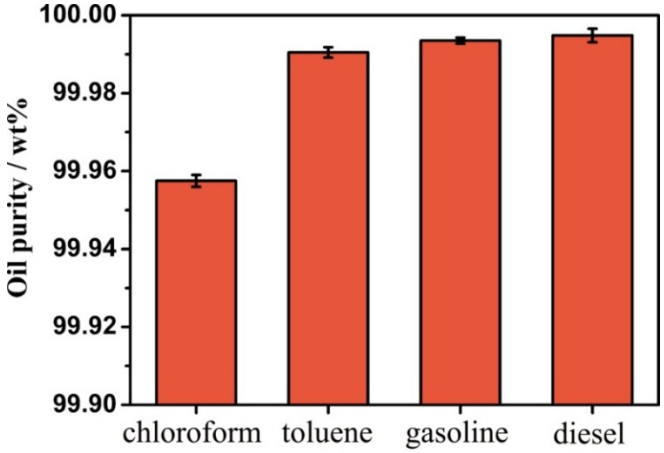

Fig. S6. The oil purity of the original oils that used in the experiments.

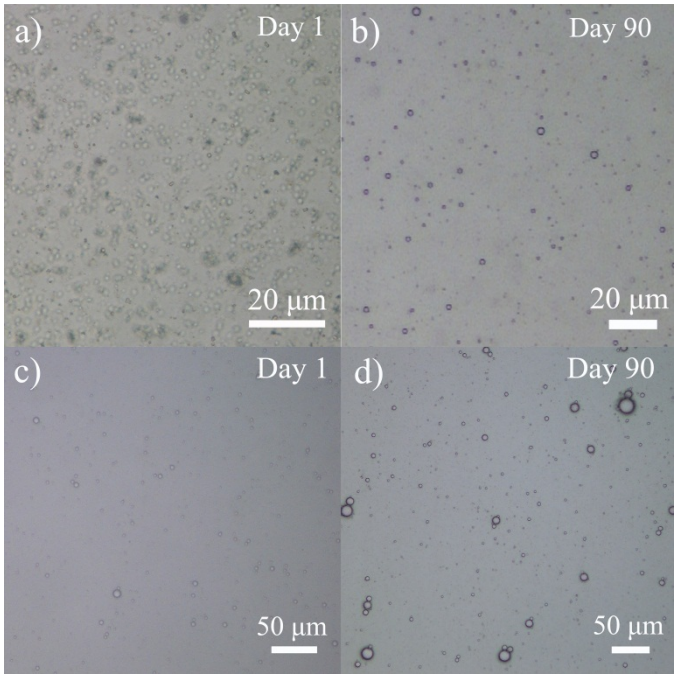

Fig. S7. Optical microscope images of water-in-toluene (above) and water-in-diesel (below) emulsions on 1st and 90th day, respectively.

Separation Efficiency

The separation efficiency of four emulsions is about 97%, which was calculated by the oil rejection coefficient (R (%)) according to:

$$R(\%) = \left(1 - \frac{C_P}{C_0}\right) \times 100$$

where C_0 and C_P are the water concentration of the original emulsions and the collected oil after the first separation. (Fig. S8)

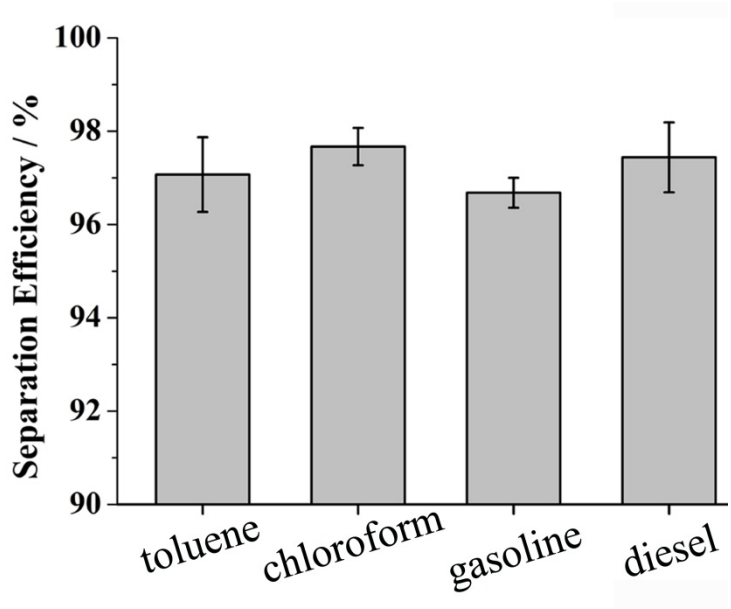

Fig. S8. The separation efficiency of the as-prepared membrane for a selection of water-in-oil emulsions.