Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Sol-Gel Fabrication of a Non-Laminated Graphene Oxide Membrane for Oil/Water Separation

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Calculation of the porosity of the NLGM

The porosity is related to the inherent density and apparent density of materials. The apparent density of NLGM can be calculated by equation as follows:

$$\rho = \frac{M}{V} = \frac{M}{Sl}$$

where ρ is the apparent density of NLGM; M and V are the weight and volume of NLGM, respectively; S and l are the area and thickness of the NLGM, respectively.

The inherent density of the NLGM can be calculated as follows:

$$\rho_o = x\rho_{GO} + (1-x)\rho_{PEI}$$

where ρ_o is the inherent density of NLGM; x is the content of GO in NLGM; ρ_{GO} is the inherent density of GO, 2.2 g/cm^3; ρ_{PEI} is the inherent density of PEI, 1.03 g/cm^3. Thus the porosity of the NLGM can be calculated according to followed equation[1]:

$$\varepsilon = 1 - \rho/\rho_o = 1 - \frac{\frac{M}{Sl}}{x\rho_{GO} + (1-x)\rho_{PEI}}$$

where ε represents the porosity.

Also, The porosity is calculated based on the followed equation:

$$\varepsilon = 1 - \rho/\rho o = \frac{\frac{m}{V_L} - \frac{m}{V_N}}{\frac{m}{V_L}} = \frac{V_N - V_L}{V_N} = \frac{l_N - l_L}{l_N}$$

where ε represent the porosity, ρ is the density of the as-prepared NLGM while ρo is the density of the LGM. We assumed that LGM was dense and free of pores. Therefore, the density of LGM can be regarded as the inherent density of NLGM. V_N and V_L are the volume of the as prepared NLGM and LGM, respectively. l_N and l_L are the thickness of the as prepared NLGM and LGM, respectively, which can be get from SEM images.

Figure S1. The gravity driven filtration apparatus used in this work.

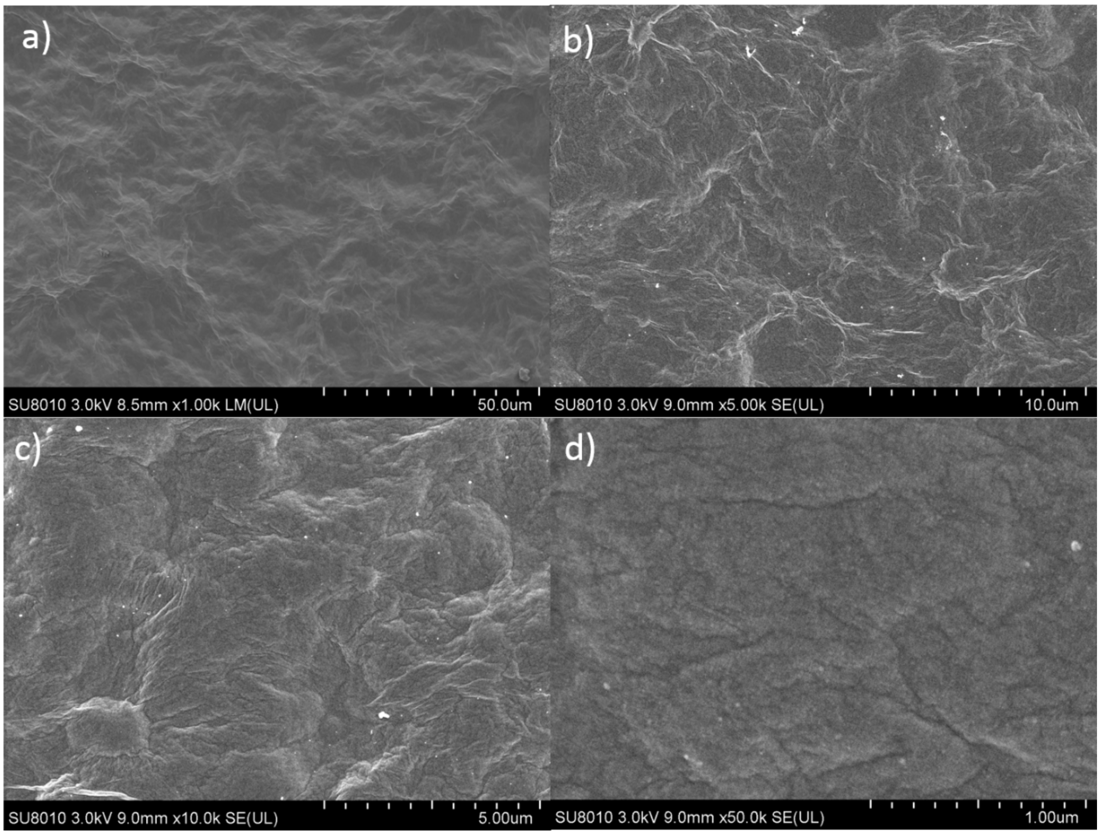

Figure S2. Top view SEM images of LGM of different magnification

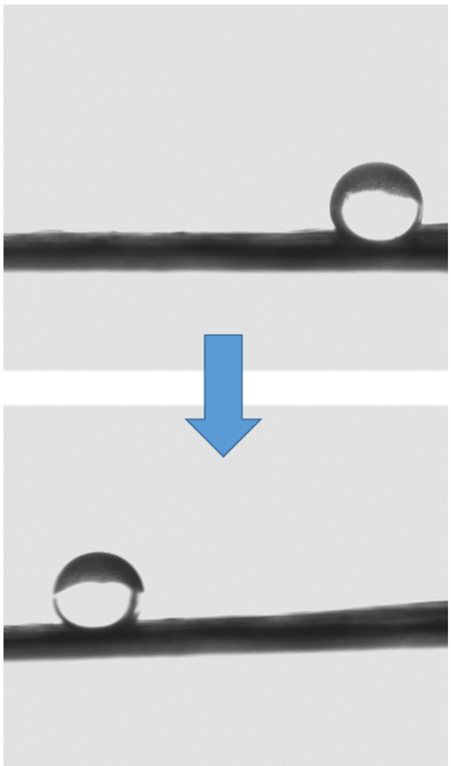

Figure S3. The sliding angle of 1,2-dichloroethane (DCE) droplets on the NLGM in water

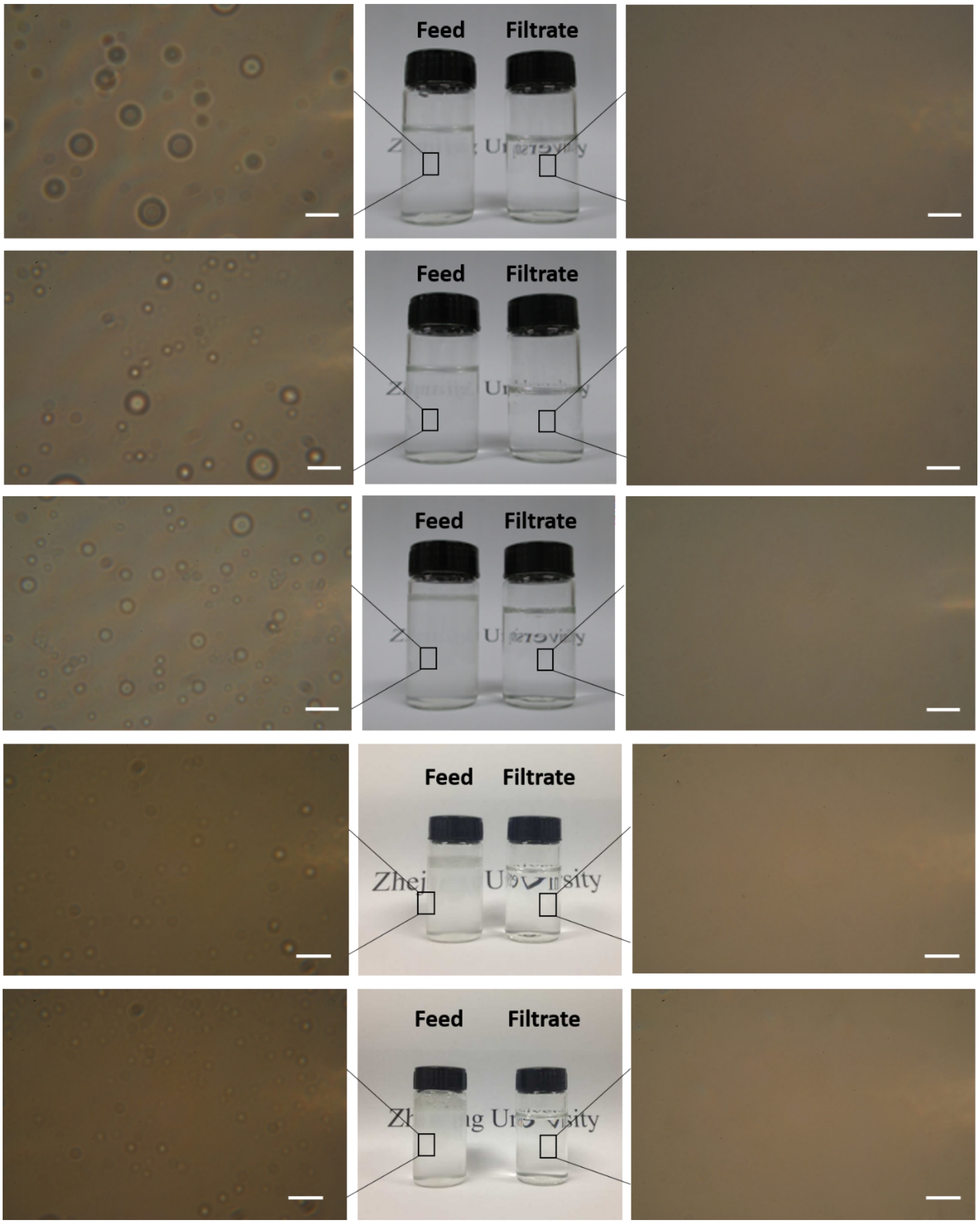

Figure S4. Separation results for various oil-in-water emulsions: hexane/water, octane/water, isopar G/water, SDS-assisted octane/water and SDS-assisted isopar G/water. All the filtrates become transparent and no droplet is observed in the corresponding optical image; scale bar=10 μm.

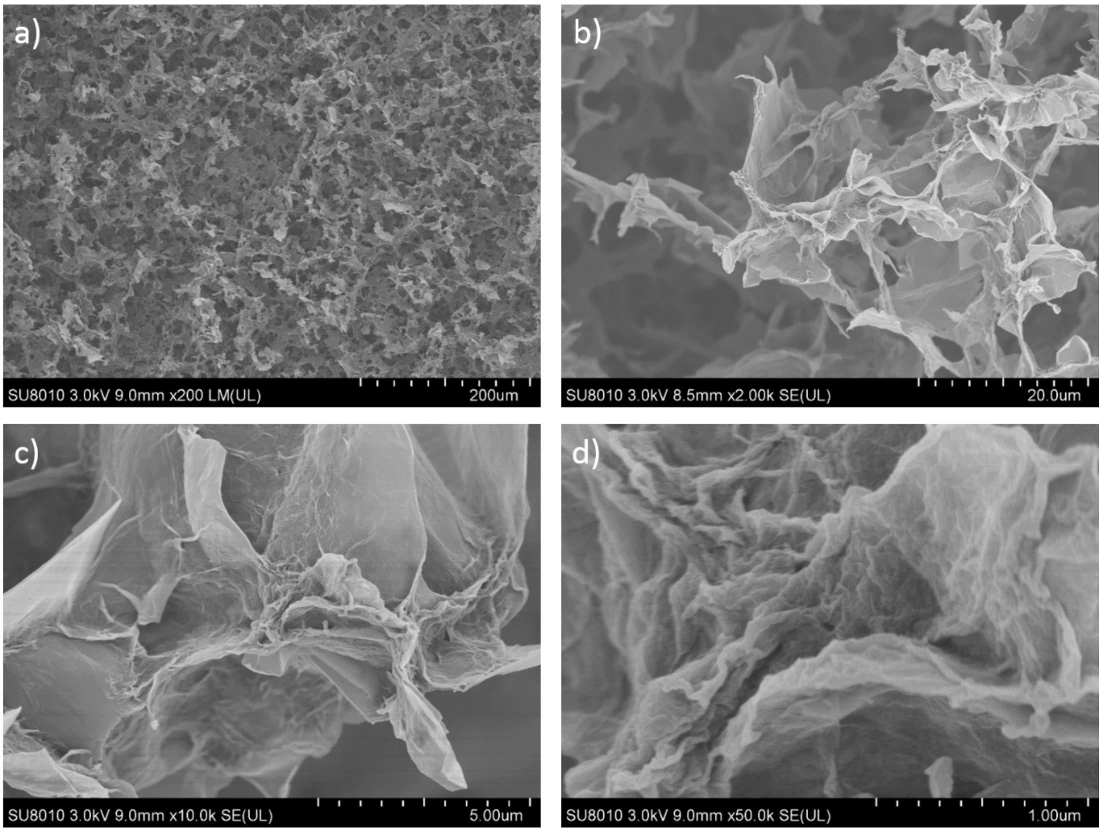

Figure S5. SEM images of the NLGM after oil/water emulsion separation performance test of different magnification

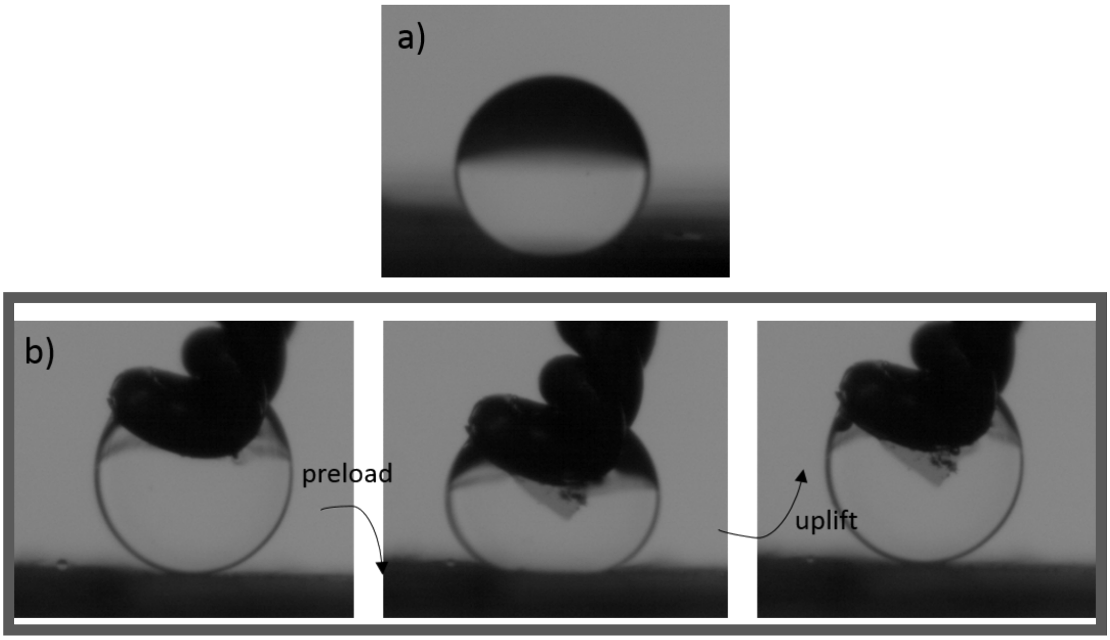

Figure S6. a) Photograph of an underwater oil droplet on the NLGM after oil/water emulsion separation performance test. b) Photographs of the simulated underwater drag deformation force tests of an oil-droplet on the NLGM after oil/water emulsion separation performance test.

Table S1. Relative atomic mass concentrations in the GO and NLGM determined by XPS analysis

Sample	XPS concentration (%)		
	C	O	N
GO	64.14	34.43	1.43
NLGM	67.62	20.5	6.89

References:

1. S. Xie, X. Liu, B. Zhang, H. Ma, C. Ling, M. Yu, L. Li and J. Li, *Journal of Materials Chemistry A*, 2015, **3**, 2552-2558.