

Supporting Information

Cellulose acetate/filter paper composite membrane for separation of oil-in-water emulsion

Jun Lei,^{ab} Zhiguang Guo,^{*ab} and Weimin Liu^b

^a Ministry of Education, Key Laboratory for the Green Preparation and Application of Functional Materials, Hubei University, Wuhan 430062, People's Republic of China

^b State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou 730000, People's Republic of China

Experimental section

1. Materials

Cellulose acetate (acetyl 39.8 wt%, hydroxyl 3.5 wt%) was purchased from Aladdin Reagent (Shanghai) Co., Ltd. Dimethylacetamide (DMAc) was purchased from Lianlong Bohua (Tianjin) Pharmaceutical Chemical Co., Ltd. Ethyl oleate was purchased from Tokyo Chemical Industry Co., Ltd. Diesel was purchased from the local market. Deionized (DI) water is purified by a two-stage reverse osmosis system. SZQ four-sided wet film preparation device was purchased from Jingdong Mall.

2. Preparation

Put 2.0 g CA and 10 ml DMAc into a beaker, heat and stir in an oil bath at 50 °C for two hours to obtain a CA solution, and let it stand for 4 hours to remove air bubbles. The CA solution was coated on a glass plate with a wet film forming machine (100 μ m), put into deionized water, and the CA film was obtained by the phase inversion method. By replacing the glass plate with fiber paper, after the same process, we can prepare a composite film.

3. Characterization

The morphologies of all the samples were characterized using field-emission scanning electron microscopy (FESEM, JSM-6701F) and Non-contact three-dimensional surface profiler (MicroAAM-800). The contact angles of the samples were measured at room temperature by a JC2000D system (Zhongchen digital equipment Co., Ltd. Shanghai, China) with a 5 μ L droplet. The chemical composition was analyzed via Fourier transform infrared spectroscopy (FTIR, Thermo Scientific Nicolet iS10). For oil-in-water emulsion, the oil contents in the collected water were determined by measuring the COD based on U.S. Environmental Protection Agency method 8000 (HACH, DRB 200). All digital photographs were taken using a cellphone (HUAWEI nova5 pro).

4. Oil-in-water emulsion separation

The oil-in-water emulsion was formed by adding 1 mL of oil (xylene, diesel, Ethyl oleate) to 100 mL of deionized water, shaking it by hand, and dispersing it evenly in ultrasonic for 4 hours. The water permeability was evaluated by filtering 5ml of pure water under a constant pressure of 20 KPa.

The antifouling performance of the composite membrane was evaluated by the value of J_r/J_p . J_p was the initial emulsion flux and J_r was the flux of three cycle filtration experiments. After each filtration cycle, wash the front and back of the composite membrane multiple times with a washing bottle.

5. Sandpaper friction

Place the composite film on 800 mesh sandpaper, load 200g weight on the film, and move 10 centimeters back and forth along the sandpaper straight line as one rubbing, and every ten times as one cycle. The rubbing experiment has a total of 5 cycles.

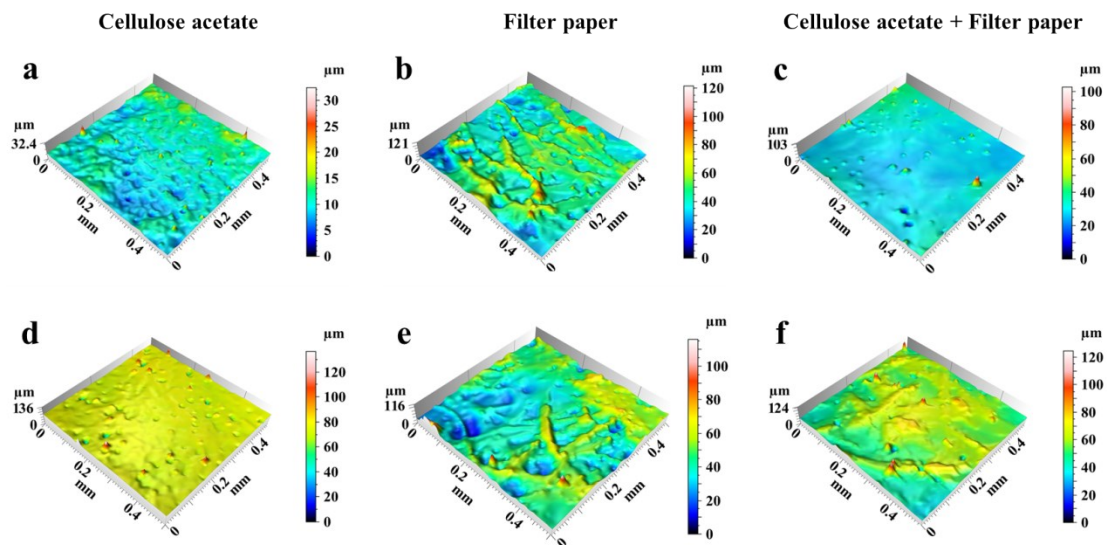


Figure S1. Three-dimensional contour map of three kinds of membranes

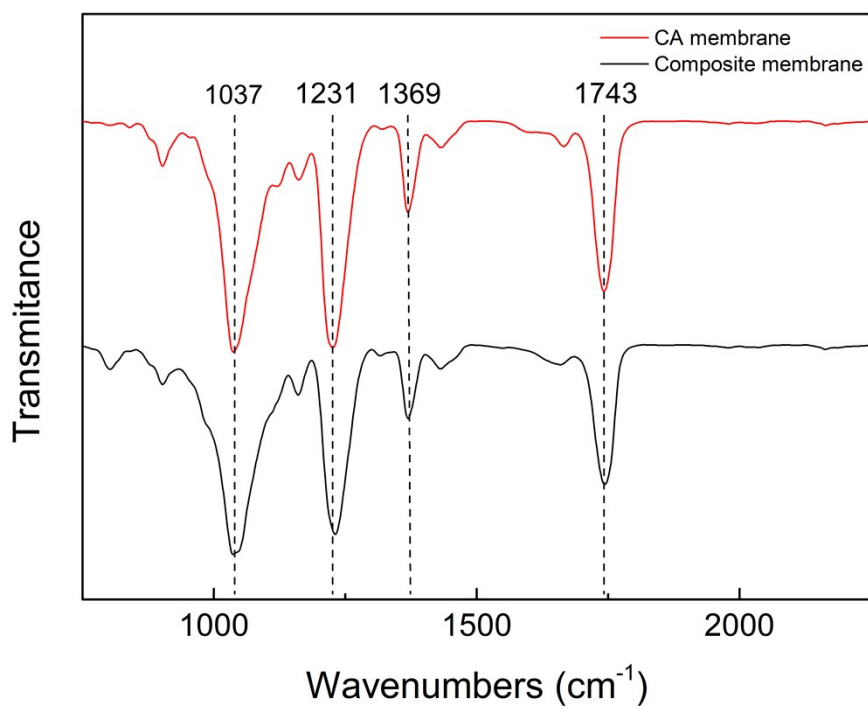


Figure S2 Infrared spectra of CA membrane and composite membrane.