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Electronic Supplementary Information

Photothermal Nanocomposite Membranes for Direct Solar Membrane Distillation

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1. TEM measurements of the nanoparticles

A transmission electron microscope operated at 100 kV (JEM-2010F FasTEM, JEOL USA, Peabody, MA) was used to characterize the morphology of SiO_2/Au NSs and CB NPs. The CB NPs were dispersed in chloroform at 5 mg/L. The SiO_2/Au NS aqueous suspension was prepared by diluting the stock suspension (4.45×10^9 particles/mL) 100 times to reach a final concentration of 4.45×10^7 particles/mL. Both nanoparticle suspensions were then sonicated for 10 min at 100 W using a sonication probe (Vibra Cell, VCX 500, Sonics and Material, Newtown, CT). For each sample, one droplet of the suspension was applied on a 400-mesh, carbon lacey film supported 400-mesh copper grid (Ted Pella, Redding, CA), and dried at room temperature before imaging. TEM images of the SiO_2/Au NSs and CB NPs are presented in Figure S1. Consistent with previously reported results,[1, 2] the SiO_2/Au NSs were spherical, and had a fairly uniform particle size of 160 nm, i.e., a 20 nm thick Au coating on the 120 nm diameter SiO_2 core. The CB NP particles exist mostly in small aggregates, with individual particle sizes of approximately 10 nm.

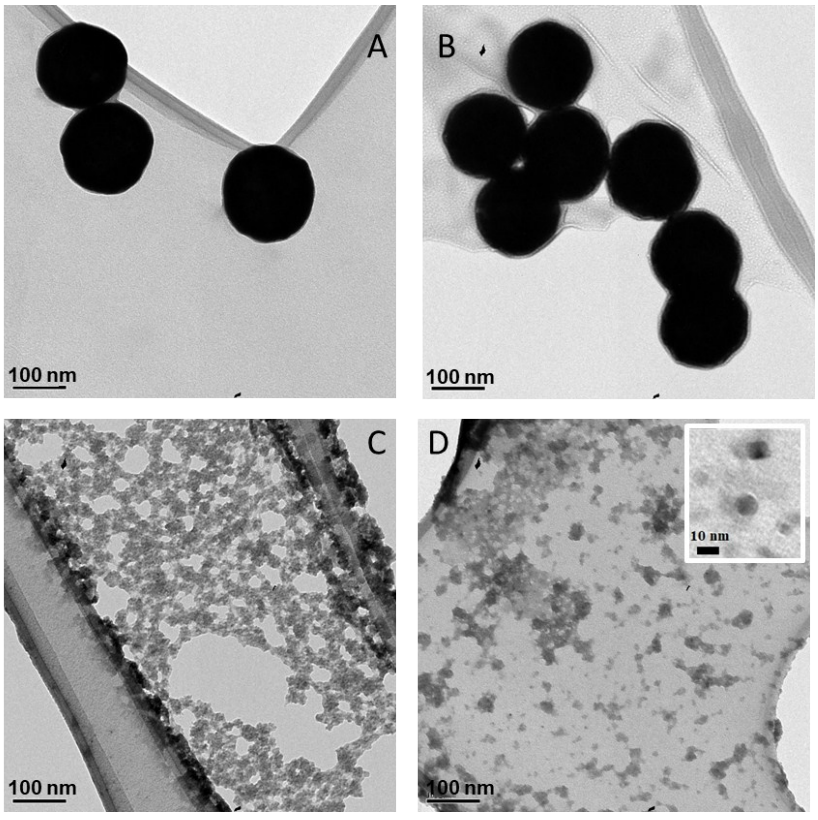

Figure S1. TEM images of the SiO_2/Au NS (A & B) and CB NP (C & D) nanoparticles.

2. Permeate mass change vs. time of the modified membranes

Representative curves of permeate mass vs. time are presented in Figure S2. The figures demonstrate good linearity of the curves (R^2 > 0.998, except for *l*NS-m), indicating good stability of membrane performance over the testing period.

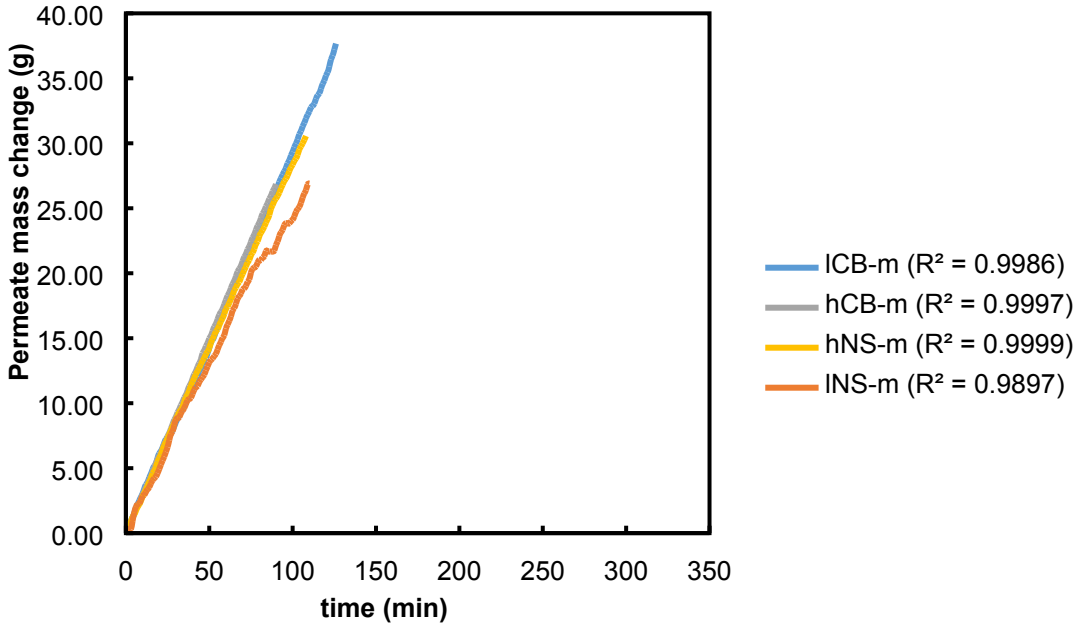

Figure S2. Representative curves of the permeate mass change over time of the modified membranes.

References

1. O. Neumann, A. S. Urban, J. Day, S. Lal, P. Nordlander and N. J. Halas, *ACS Nano*, 2013, **7**, 42-49.
2. S. J. Oldenburg, R. D. Averitt, S. L. Westcott and N. J. Halas, *Chemical Physics Letters*, 1998, **288**, 243-247.