Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Carbonized sucrose-coated PDMS sponge for highly efficient and self-cleaning solar evaporator[1] JAEHYEON LEE, SANG JOON LEE, Pohang Institute of Science and Technology — Solar steam generation is a promising technology for seawater desalination and water purification. However, most state-of-the-art technologies are expensive and suffer from insufficient solar-to-evaporation conversion efficiency and fouling problems, which limit their practical applications. Here, we propose a new superhydrophilic thermally-insulated macroporus membrane (STIMM) composed of carbonized sucrose and polydimethylsiloxane (PDMS) as an efficient solar evaporator. The coupled effect of superhydrophilicity and heat localization of STIMM was found to maximize the solar-to-evaporation conversion efficiency. The highest evaporation rate of 7.702 kg/h/m^2, 8.7 times higher than that of only water, was achieved with solar-to-evaporation conversion efficiency of 99.8%. The STIMM was applied to obtain pure drinkable water from saline water with 20 wt% high salinity, with a 99.997% desalination efficiency. In addition, the macro-pore size of STIMM enabled self-cleaning with 93.1% of salt rejection rate, which mitigate the fouling problem substantially. The present results demonstrate a highly effective and sustainable solar steam generator, which would be applied for solar thermal desalination and water purification systems.

[1]NRF-2017R1A2B3005415

Jaehyeon Lee
Pohang Institute of Science and Technology

Date submitted: 01 Aug 2019 Electronic form version 1.4