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Photonic crystals umbrella for Thermal desalination: Simulation study

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For sustainable water desalination, there is a worldwide push towards solar thermal desalination with the objective to limit the amount of consumed energy in other desalination technologies and maximize the resulting freshwater from saline water. Here, we demonstrate a photonic crystals solar umbrella that covers the saline water surface, demanding to absorb all the incident electromagnetic wave and remit it as greater wavelengths in the range of mid-infrared (MIR) to be highly absorbed and localized close to the water surface. The temperature of the saline water with a refractive index of 1.3326 is reached to 45 °C after one hour of illumination with the incident power intensity equal 680(w/m^2). Hence, by adding one-dimensional PCs the surface temperature is reached 77 °C. Also, by adding 2D PCs to allow the vapor to flow up through the pores of the structure with the diameter of the pore equal to 500 nm, the surface temperature is reached 87 °C. Thus, the effective use of electromagnetic waves and warmth localization at the surface of saline water is accomplished by radiative coupling with the effect of 2D PCs. We design the considered structure by using COMSOL multiphysics which based on the finite element method (FEM).

Biography

Arafa H.Aly has completed his PhD at the age of 35 years from Cairo University and postdoctoral studies from Soeul national university, Chonnam national university, ICTP, AUB, and Zaragoza University. He is the chairman of Eg-MRS which is the oldest scientific society in Egypt and Middle East. He has a distinguished 25-years career in material sciences and optical and acoustical applications. He has supervised for many master's and doctoral theses organized more than 40 conferences. He has published more than 150 papers in reputed journals and has been serving as an editorial board member of repute