

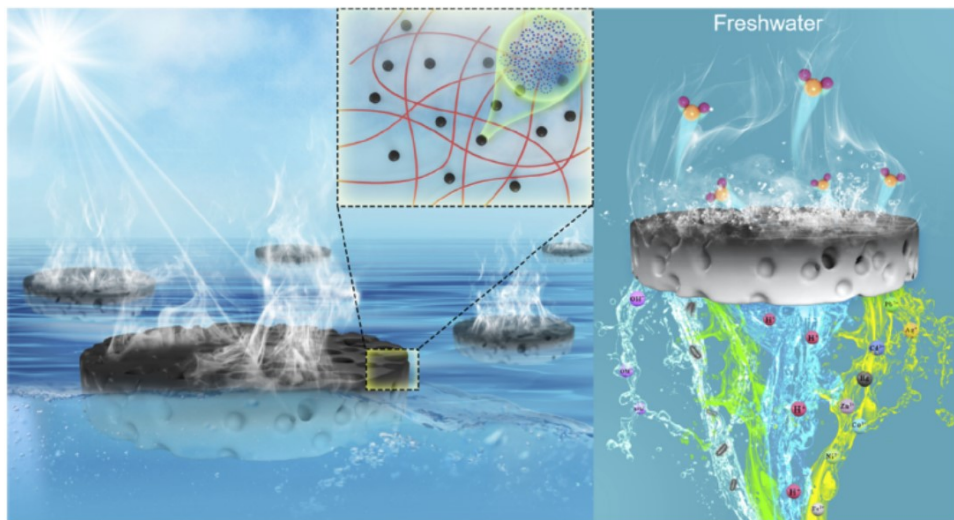
A Boron Carbide-based Aerogel Foam for Water Evaporation



Energy & Environment

Nanotechnology and New Materials

Waste Treatment/Management



Scheme 1. Schematic illustration of solar water evaporation and wastewater purification using the boron carbide bilayer foam.

Opportunity

Owing to global climate change, city industrialization, growth of population and environmental pollution, supply of freshwater is crucial and becomes a threat to the life of people particularly in some developing countries. Solar water evaporator likely be a promising approach by desalinating seawater and purifying wastewater both economically and environment friendly. However, some available solar evaporators for water evaporation include plasmonic metal nanoparticles (NPs), carbonaceous and inorganic materials, and require precious metal and advanced processing techniques for fabrication. The relatively high cost-to-performance of those materials and fabrications hinders practical application of solar water evaporation.

Technology

The present technology relates to a simple and economical method for preparing Boron Carbide Bilayer Foam (BCBF) by utilizing commercially available low-cost raw materials B₄C for solar water evaporation. By integrating full-solar absorbing boron carbide into a porous polymer framework, the BCBF is able to achieve a good hydrophilic wettability, heat-shielding and solar-thermal conversion for efficient evaporation rate. Moreover, it demonstrates ultra-high cost-effectiveness and great stability under extreme conditions for practical water purification.

IP Status

Patent filed



Technology Readiness
Level (TRL) ?

4

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Follow-on
Funding

Proof
Concept

Build Value

Advantages

- Shows high cost-effectiveness and can be prepared with simple processing method;
- Works well in contaminated water with heavy metals, dyes and microorganisms;
- Works under extreme conditions, including concentrated acid, strong alkali and high salinity;
- Demonstrates high evaporation rate of $2.8\text{kg/m}^2/\text{hr}$ with 93% solar evaporation efficiency at an intensity of 1 kW/m^2 .

Applications

- Practical water purification from seawater and multiple wastewaters by solar energy.

