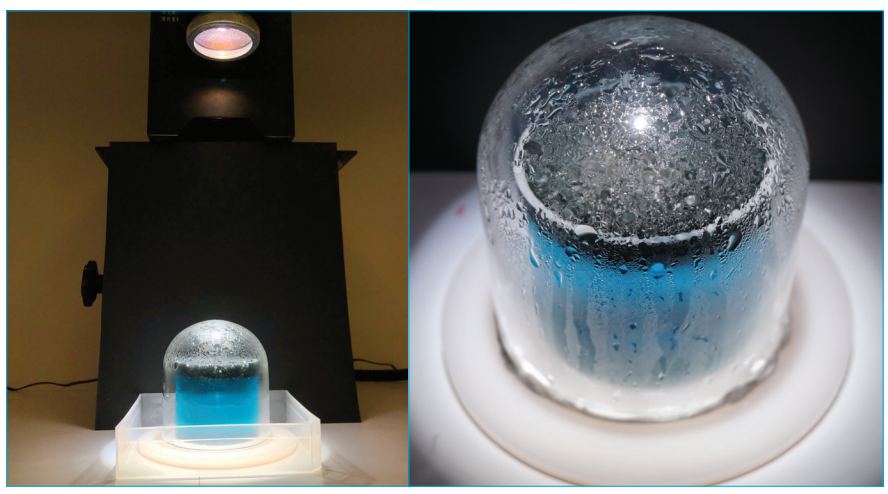
THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

能產生蒸氣的廢棄海綿太陽能吸收器
Waste Sponge as Solar Absorber for Vapour Generation

用以提取淡水的簡便、低成本、可持續發展、升級再造方案
A simple, low-cost and sustainable upcycling method for extracting freshwater

雖然地球約70%的表面面積被海水包圍，但淡水的比例只佔總水量的2.5%，而由於大部分淡水都儲存於冰川和積雪中，實際能夠飲用的淡水只有全球水總量的1%。要解決水資源的問題，利用太陽能提取淡水是一種可持續發展的策略。理大設計了一個簡便的太陽能蒸發裝置，以加工廢棄黑色海綿作太陽能吸收器。該裝置可浮於水表面，能把太陽能轉換成熱能，並蒸發表層水，所產生的水蒸氣於低溫的裝置上蓋內壁凝固，形成蒸餾水。該太陽能裝置能在太陽下持續收集蒸餾水，亦可應用於海水淡化、廢水處理及酒精提純等方面。

使用廢棄的包裝用海綿作太陽能吸收器
Upcycling the packaging waste sponge as solar absorber



簡便的太陽能蒸發裝置
A convenient solar steam generation device

專利申請編號及國家: 201610556237.7 (中國)

特色與優點

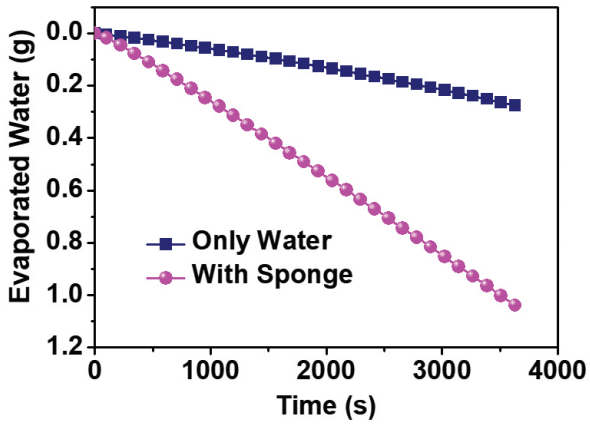
- 利用可再生、可持續發展及隨時可動用的太陽能作能量來源，蒸發時不需額外能源
- 使用廢棄的包裝用海綿作太陽能吸收器，將廢物升級再造，減少固體廢物
- 現有的太陽能蒸餾裝置以昂貴的光學聚光片為太陽能吸收器，改用廢海綿即可大大降低成本
- 經多巴胺處理後的海綿具良好的親水性，更容易被濕潤，讓水份可以更流暢地輸送到海綿表面蒸發

應　用

- 太陽能蒸餾處理
- 太陽能海水淡化
- 太陽能廢水處理
- 太陽能酒精提純

獎　項

第一屆亞洲發明展覽會 - 香港 - 銀獎 (2018年12月)



經特殊處理的黑色廢棄海綿有更快的蒸發速率
Specially treated recycled black sponge shows a faster evaporation rate

Around 70% of our world is covered in water, but only 2.5% of the earth's water is fresh. As most freshwater is trapped in glaciers and snowfields, easily accessible freshwater represents only 1% of our earth's total water volume. Utilizing solar energy to extract freshwater is a green and promising strategy in addressing this issue. PolyU has designed a convenient solar steam generation device by using specially treated recycled black sponge as solar absorber. It can float on the air-water surface while converting solar energy into heat to evaporate the top layer of liquid. Then the generated vapour will condense on the cold inner cover of the device and become freshwater droplets, which can be collected as distilled water continuously under the sun. The concept can also be adopted for solar waste water treatment, solar alcohol concentration or solar distillation of other materials.

Patent Application No.: 201610556237.7 (China)

Special Features and Advantages

- Uses solar energy, which is renewable, sustainable and readily available, as the device's sole energy source
- Upcycling of packaging waste sponge as solar absorber helps reduce solid waste
- Has lower production cost when compared with existing solar distillation plants which use expensive optics for solar radiation
- Hydrophilicity of sponge modified by dopamine is improved, leading to good wettability. Water can be effectively drawn up to the air-water interface and evaporated

Applications

- Solar distillation
- Solar seawater desalination
- Solar waste water treatment
- Solar alcohol concentration

Award

Silver Medal – 1st Asia Exhibition of Inventions Hong Kong (Dec 2018)

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