

Simultaneous Production of Steam and Electricity Using a Cone-shaped Solar-thermal Device

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More and more coastal areas are submerged as a inevitable consequence of global warming. So, the demand for clean water for those areas is very essential. As a solution, we devised an effective device using photo-thermal conversion that can generate steam and electricity simultaneously. The cone made of multi-walled carbon nanotubes (MWCNTs) and cellulose paper, which constitute the outer side, act as a black body to produce steam through photo-thermal conversion. The whole cone and Fe-based metal wire can act as a metal-air battery to produce electricity. Experimental results show that the system has a high water evaporation rate of $1.65 \text{ kg} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ during the daytime and it can act as a metal-air battery when used with a 0.6 M NaCl electrolyte solution (simulated sea water). High power of 0.7 mW can be obtained with the Fe-based metal wire area of 0.1 cm². In this study, the effects of various factors such as: MWCNTs loading amount, different outer surface area of cone for a similar sunlight source area and lots of salt electrolytes on the performance of the device were also systematically investigated.