

# Global Challenges

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## Supporting Information

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Enhanced Steam Temperature Enabled by a Simple  
Three-Tier Solar Evaporation Device

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## Supporting information

### Enhanced Steam Temperature Enabled by a Simple Three-tier Solar Evaporation Device

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Preparation of  $\text{Cu}_9\text{S}_5$ : The prepared 40 mg  $\text{Cu}_2\text{O}$  was added to the mixed liquid of 25 ml of ethanol and 15 mL of deionized water. Under stirring, 0.3 g of urea, and 70 mg of  $\text{C}_2\text{H}_5\text{NS}$  were added in above solution, followed by stirring for 30 minutes. Then transferring the mixed solution to 50 mL autoclave, sealed, and heated at 160 °C for 24 h. After cooling to room temperature, the sample was centrifuged with ethanol, deionized water for several times (10000rpm, 10 min), and dried at 60 °C in a vacuum drying oven. Finally, the sample was annealed at 300 °C in Ar. The heating rate and soaking time was 5 °C min<sup>-1</sup> and 2 h, respectively.

Preparation of  $\text{MoS}_2$ : 200 mg of  $\text{Na}_2\text{MoO}_4 \cdot \text{H}_2\text{O}$ , 0.6 g of urea, and 140 mg of  $\text{C}_2\text{H}_5\text{NS}$  were added in the mixed liquid of 25 ml of ethanol and 15 mL of deionized water,

followed by stirring for 30 minutes. Then transferring the mixed solution to 50 mL autoclave, sealed, and heated at 160 °C for 24 h. After cooling to room temperature, the sample was centrifuged with ethanol, deionized water for several times (10000rpm, 10 min), and dried at 60 °C in a vacuum drying oven. Finally, the sample was annealed at 300 °C in Ar. The heating rate and soaking time was 5 °C min<sup>-1</sup> and 2 h, respectively.

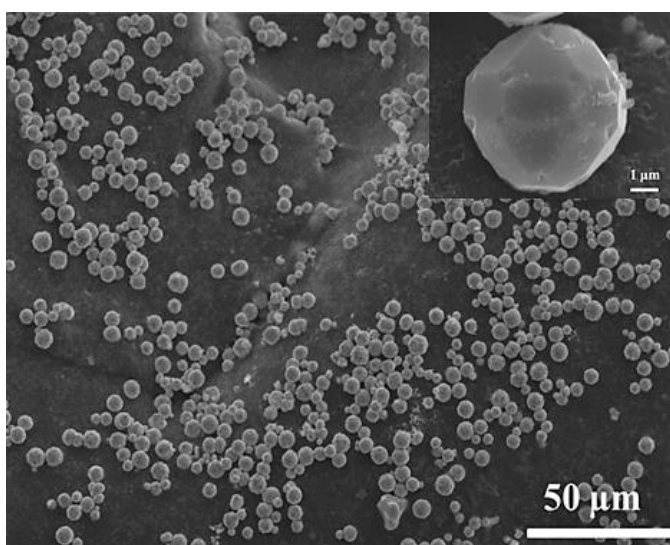


Figure S1. SEM image of Cu<sub>2</sub>O

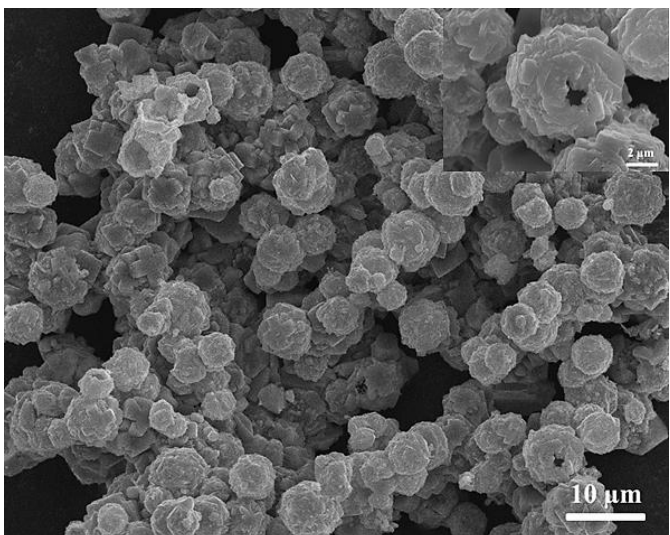


Figure S2. SEM image of Cu<sub>9</sub>S<sub>5</sub>.

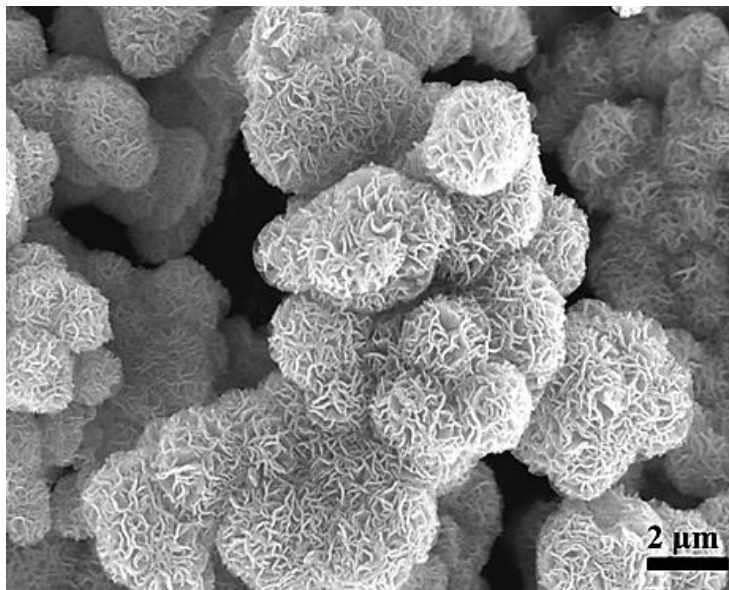


Figure S3. SEM image of MoS<sub>2</sub>.

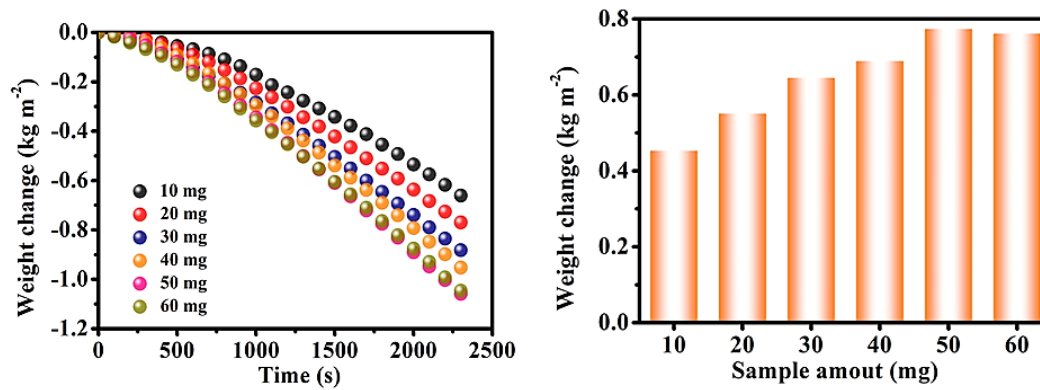


Figure S4. The weight change of water evaporated with different amount MoS<sub>2</sub>@Cu<sub>9</sub>S<sub>5</sub> (10 mg, 20 mg, 30 mg, 40 mg, 50 mg and 60 mg) incorporated into SA.

Table S1. The photothermal interfacial evaporation performance of different samples. The comparative data experiment was completed on the same day and under the same conditions. These samples were tested for one hour respectively.

Materials	Weight change (kg m <sup>-2</sup> )	Average evaporation rate (kg m <sup>-2</sup> h <sup>-1</sup> )	Stable evaporation rate (kg m <sup>-2</sup> h <sup>-1</sup> )
water	0.176	0.176	0.238
SA	0.534	0.534	0.603
CuO <sub>2</sub> -SA	1.131	1.131	1.334
Cu <sub>9</sub> S <sub>5</sub> -SA	1.277	1.277	1.38
MoS <sub>2</sub> -SA	1.716	1.716	1.94
MoS <sub>2</sub> @Cu <sub>9</sub> S <sub>5</sub> -SA	1.888	1.888	2.15

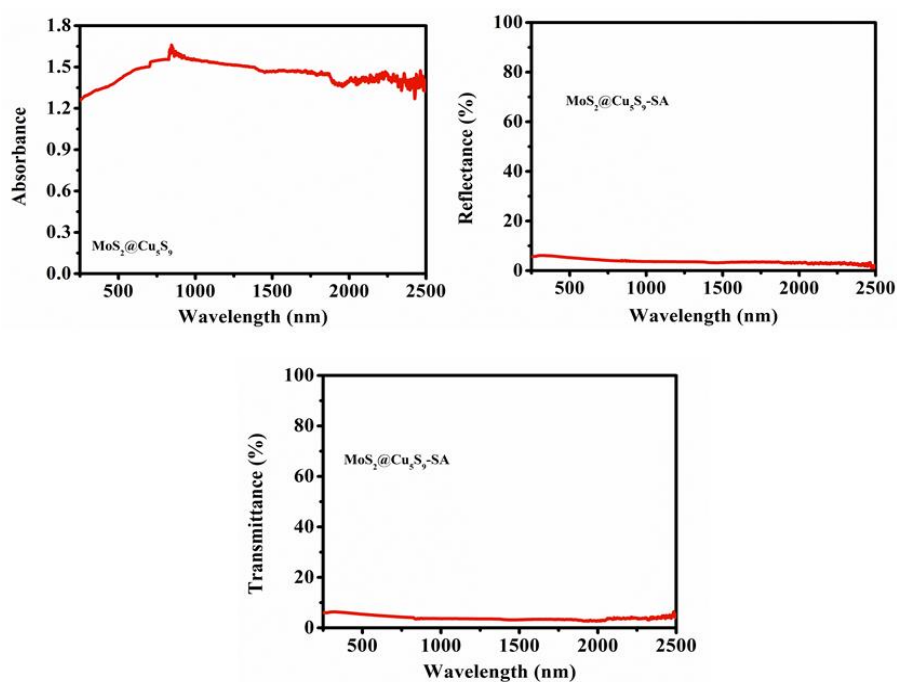


Figure S5. The light absorbance of MoS<sub>2</sub>@Cu<sub>9</sub>S<sub>5</sub> after one year. The light reflectance and transmittance of MoS<sub>2</sub>@Cu<sub>9</sub>S<sub>5</sub>-SA after one year.

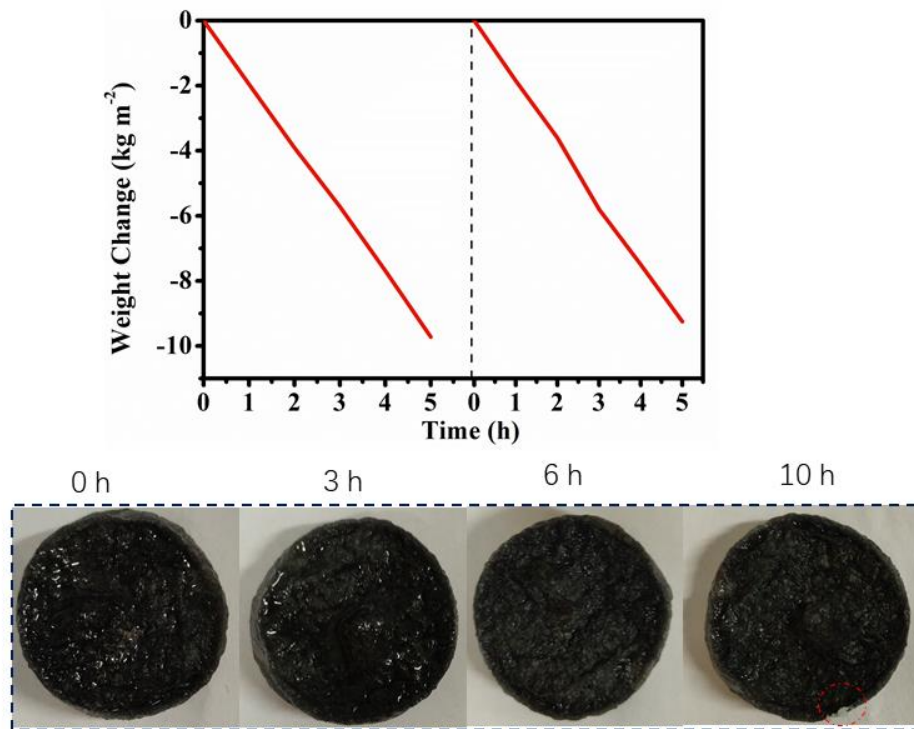


Figure S6. The photothermal performance of  $\text{MoS}_2@Cu_9S_5\text{-SA}$  after one year.

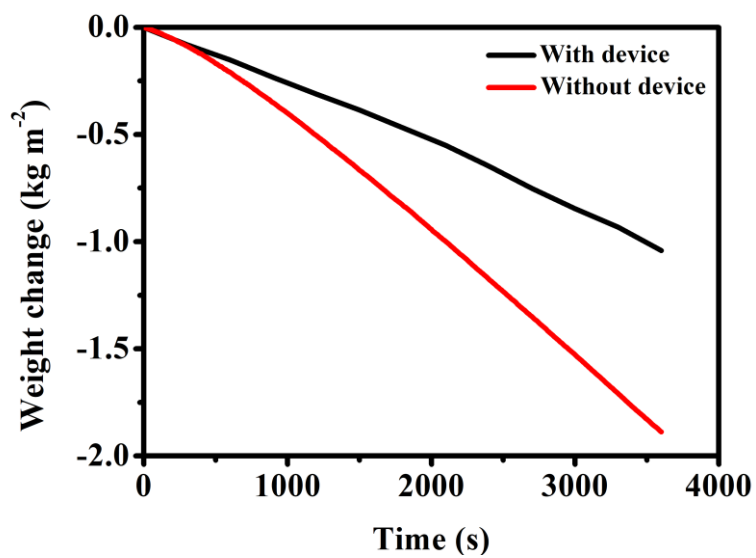


Figure S7. The weight change of evaporation water with and without three-tier device.

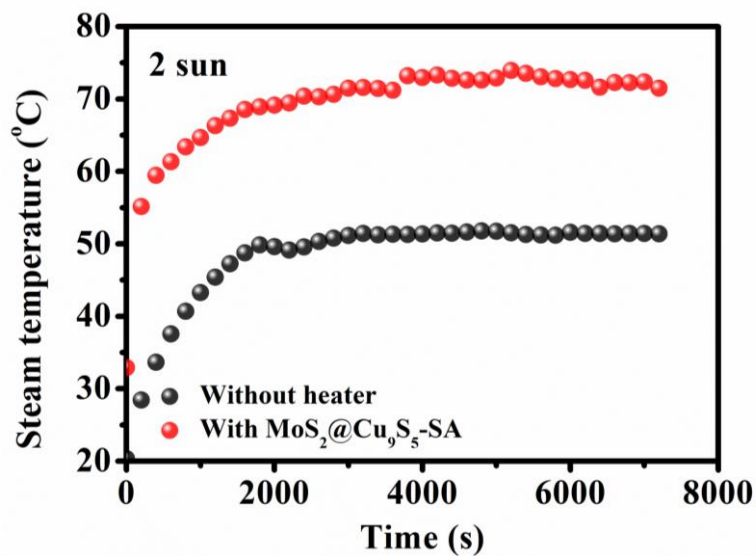


Figure S8. The change of steam temperature without heater and with MoS<sub>2</sub>@Cu<sub>9</sub>S<sub>5</sub>-SA as the upper heater under two sun.

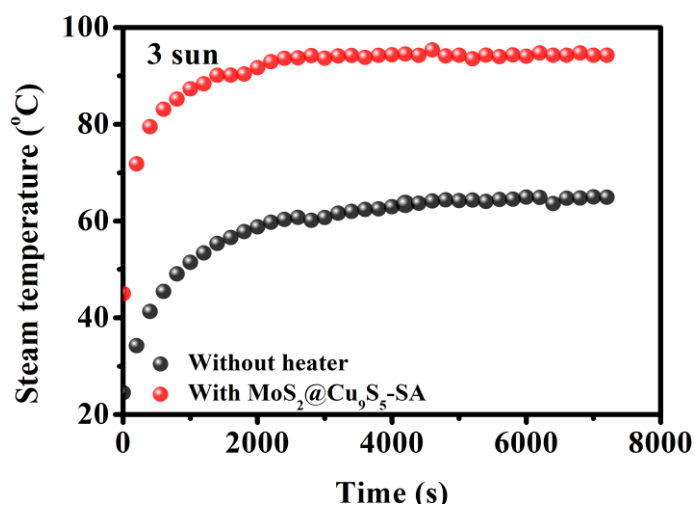


Figure S9. The change of steam temperature without heater and with MoS<sub>2</sub>@Cu<sub>9</sub>S<sub>5</sub>-SA as the upper heater under three sun.