Two-dimensional Defective Tungsten Oxide Nanosheets for Rapid and Efficient Solar Steam Generation

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Introduction

- Solar-driven evaporation by local hot spots in a solid-liquid interface is an efficient route to utilize solar energy.
- Two-dimensional (2D) defective WOx nanosheets as novel and high performance photo-absorbers were developed to generate solar steam.
- Water evaporation efficiency of WOx nanosheets could be up to 78.6% with the increasement of oxygen vacancies under 1 $kW \cdot m^{-2}$ irradiation.
- Oxide defect engineering was used to improve the photothermal conversion capacity of 2D transition metal oxide for efficient solar steam generation.

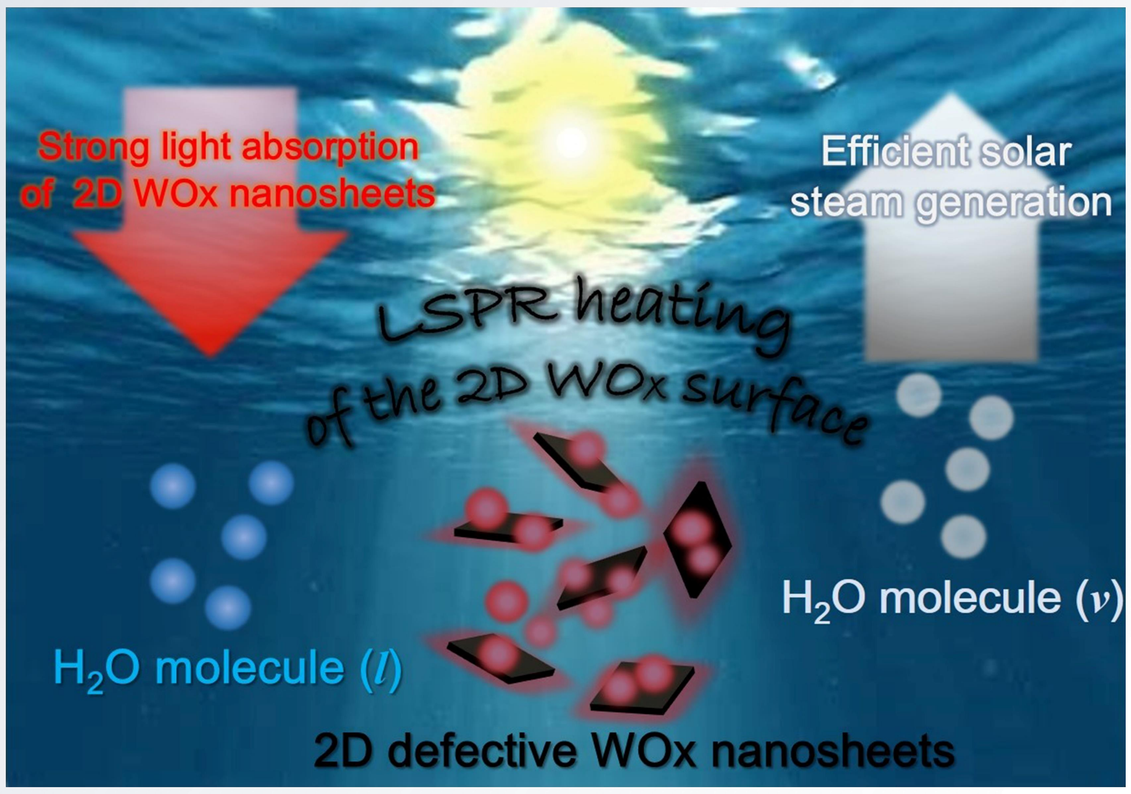

Fig. 1 Schematic of 2D defective WOx as a photo-absorber for enhancing solar steam generation.

Solar Steam Generation

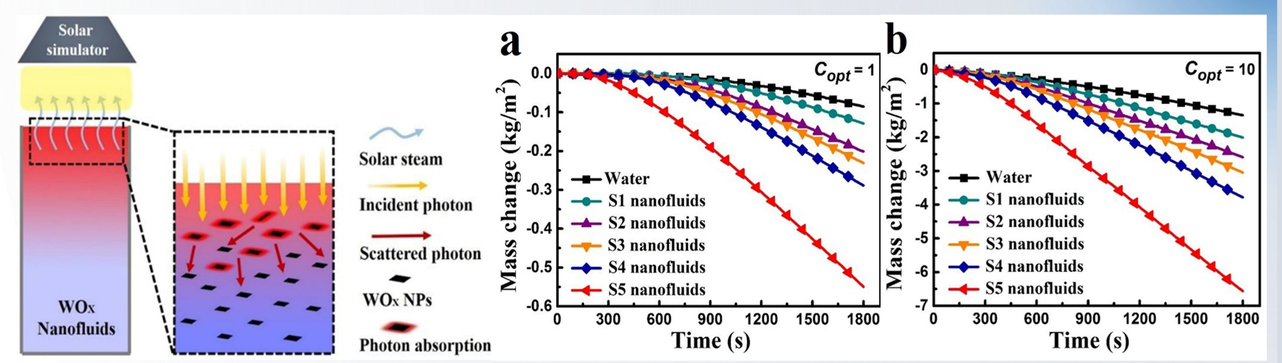

Fig. 3 The Schematic of the experimental device for solar steam generation. (a) The solar-driven mass change of water under different light intensities.

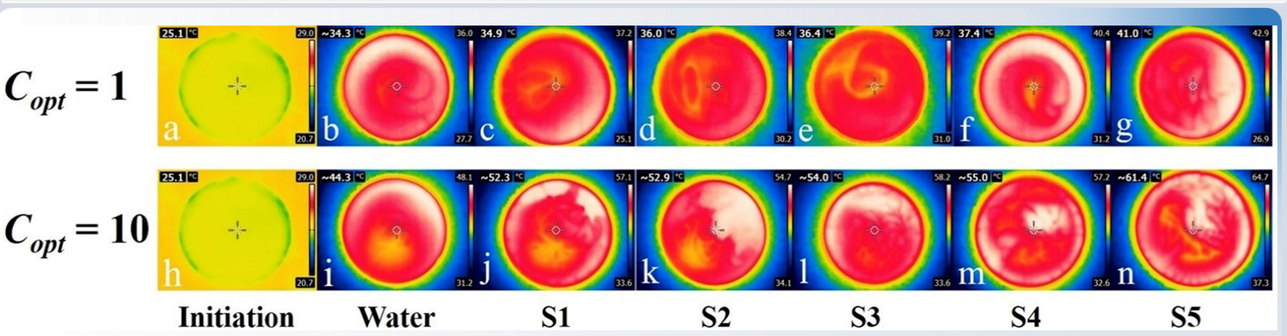

Fig. 4 The heat behaviors of pure water and different WOx nanofluids after 1800 s illumination under different light intensities, respectively.

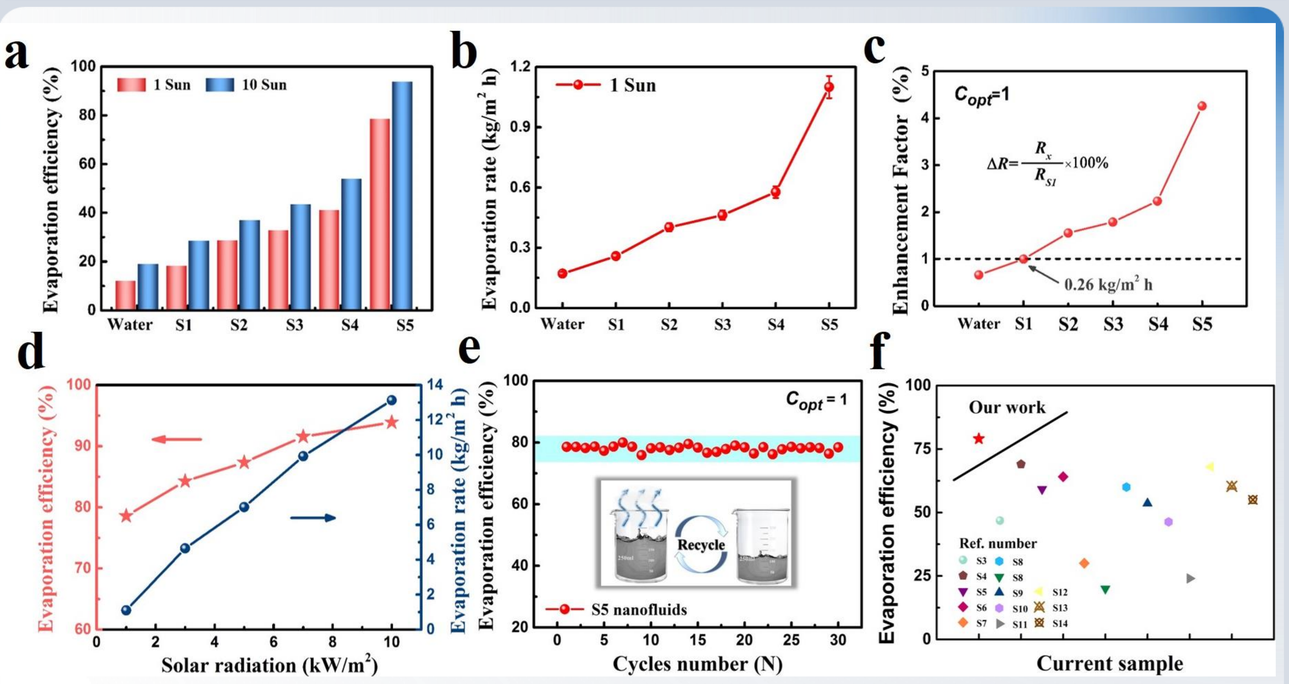

Fig. 5 Steam-generation performances of 2D defective WOx nanosheets.

Results and Discussion

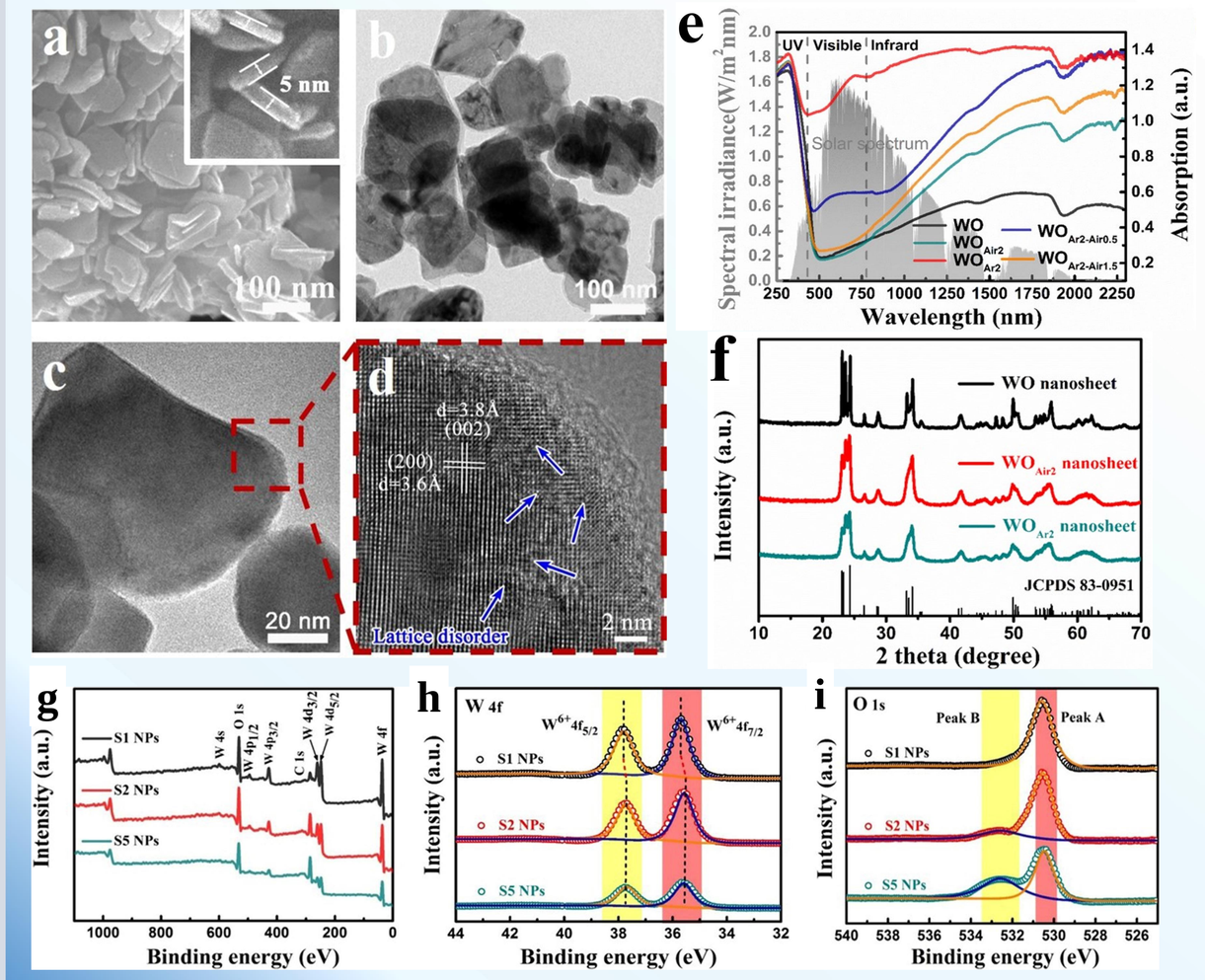

Fig. 2 Characterization of 2D defective WOx nanosheets with different concentrations of oxygen vacancies.

Conclusion

1. The 2D WOx nanosheets with different concentrations of oxygen vacancies were synthesized using a modified oxygen defect engineering.
2. The oxygen vacancies effect of WOx nanosheets on photothermal conversion was explored for generating solar steam under solar simulator.
3. The solar steam generation results evidenced that the photothermal conversion efficiency was enhanced by oxygen vacancies.
4. More importantly, our findings provided an extensive reference value for the further study about photothermal conversion material especially transition metal oxide.

Acknowledge

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