

# Oxygen-deficient solar power generation and cooling

Can a solar-driven cogenerator increase energy exchange between water evaporation modules?

In summary, we have demonstrated a novel solar-driven cogenerator that employs the PIC effect to intensify energy exchange between its power generation and water evaporation modules, resulting in optimal efficiency for both power and water production.

Do solar power plants need water-efficient cooling technology?

Water-efficient cooling technology is essential for thermoelectric plants, especially for concentrated solar power plants located in arid regions with high solar flux. Concentrated solar power plants are frequently located in water stressed regions (Sun et al., 2017).

How much energy does a co-localized solar system save?

Moreover, the radiative cooling power at ambient temperature was measured to be  $63.8 \text{ W/m}^2$  under peak sunlight and increased to  $87.0 \text{ W/m}^2$  at night, underscoring the system's continuous cooling performance. The electricity savings afforded by this co-localized system can surpass those of a regular solar cell by up to 30%.

Can daytime radiative cooling and photovoltaic power generation work together?

In a recent issue of Cell Reports Physical Science, Zhu and colleagues unveil a system that remarkably achieves simultaneous daytime radiative cooling and photovoltaic (PV) power generation within the same spatial footprint, establishing a new strategy to unlock the full potential of both renewable energy sources.

How does oxygen deficiency affect  $\text{WO}_3$ ?

For instance, Zhang et al. 76 showed oxygen deficiency in reduced  $\text{WO}_3$  (R- $\text{WO}_3$ ) via EPR that depicted a typical  $g$  parameter of 2.002 for R- $\text{WO}_3$  (Figure 9 a,b). Presence of oxygen vacancies traps unpaired electrons to absorb the recorded resonance.

What factors affect the operation of cooling systems?

A primary consideration for the operation of cooling systems is the water quality, and therefore treatment technology of the makeup stream.

The cascade heat recovery method optimizes the utilization of solar power, resulting in increased net power production (12.56 MW), cooling capacity (2.01 MW), and ...

A free-standing oxygen-deficient hydrogenated  $\text{TiO}_2$  nanorod arrays decorated carbon paper (CP) electrode ( $\text{TiO}_{2-x}$  NRAs/CP) is fabricated by a facile thermal reduction ...

The specially processed oxygen deficient Nano porous ferrite/metal oxide attached with two dissimilar electrodes known as hydroelectric cell to generate electricity using ...

Here, we present oxygen-deficient black  $\text{ZrO}_{2-x}$  as a new material for sunlight absorption with a low band gap around  $\sim 1.5$  eV, via a controlled magnesiothermic reduction in ...

Oxygen vacancies in complex metal oxides and specifically in perovskites are demonstrated to significantly enhance their electrocatalytic activities due to facilitating a ...

The solar  $\text{H}_2$  generation with the oxygen deficiency of Al-Cu ferrite ( $\text{Al}_3\text{Cu}_2\text{Fe}_2\text{O}_{12}$ ,  $3a+b+3c=8$ ) has been studied for application to conversion of solar thermal ...

In summary, we have demonstrated a novel solar-driven cogenerator that employs the PIC effect to intensify energy exchange between its power generation and water ...

Safe and efficient power generation technologies using renewable sources are becoming increasingly important for sustainable energy development, with solid oxide fuel ...

The emergence of pathogenic bacteria in water sources brings a serious threat to healthcare because they can cause bacterial infectious diseases (Yuan et al., 2019, Li et al., ...

Xudong Zhao is the Director of Research and Professor at the School of Engineering and Computer Science, University of Hull (UK), and has enjoyed a global reputation as a distinguished academia in the areas of renewable ...

The impact of the power generated by wind turbines (in the integrated structure for simultaneous production of hydrogen and liquid oxygen) on the produced liquefied oxygen, ...

Oxygen-deficient titanium dioxide ( $\text{TiO}_{2-x}$ ) is prepared by  $\text{NaBH}_4$ -reduction, which exhibits better optical absorption in the visible and infrared regions than  $\text{TiO}_2$ . The ...

High-grade energy is an essential and undeniable requirement for all humans, driving exploration of initiatives to meet this need. However, in recent decades, the pursuit of ...

The protonic ceramic electrochemical cell (PCEC) is an emerging and attractive technology that converts energy between power and hydrogen using solid oxide proton ...

All-day continuous electrical power generator by solar heating and radiative cooling from the sky. Author links open overlay panel Li Yu a, Zhiyuan Xi a, Shuang Li a, Dan ...

A novel solid-oxide-fuel-cell-based cooling, heating, and power (CCHP) system integrated chemical looping hydrogen generation is proposed, in which the chemical looping ...

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Solar-driven atmospheric water extraction (SAWE) is a sustainable technology for decentralized freshwater supply. However, most SAWE systems produce water ...

In a recent issue of Cell Reports Physical Science, Zhu and colleagues unveil a system that remarkably achieves simultaneous daytime radiative cooling and photovoltaic (PV) ...

Hysteresis behavior is a unique and significant feature of perovskite solar cells (PSCs), which is due to the slow dynamics of mobile ions inside the perovskite film ...

Au nanoparticles can further enhance the full solar absorption of oxygen-deficient TiO<sub>2</sub>. ... concentrated solar power generation, and solar heating. In a solar-thermal system, ...

The objective is to quantify the influence of a thinned shell and a hydrated shell on power generation potential resulting from aluminum oxidation. The goal is to engineer metal ...

Solar power. Might need to repair meteor damage occasionally until you can set up defences. Plug slugs though better to have a metal volcano to feed them. Not tried myself but I think 5x ...

This work investigates the behavior of a solar power generation system that consists of a concentrated photovoltaic/thermal (CPV/T) system that utilizes an Organic ...

Combined cooling, heating, and power systems and desalination plants are two perfect examples that show how solar power can be integrated into current technologies. ...

NGCC flexible power generation and solar methanol production are two promising ways to increasing solar dispatchability. ... when the solar power supply is in ...

Kim modeled a combined power generation and cooling system comprising an ORC and a VCRC using R245fa, R114, R600, R142b, R152a, and R1234yf. The results showed that the thermal efficiency of the combined ...

A particularly promising enhancement would involve integrating coolant pipelines into the system, which could facilitate the utilization of cooling power and waste heat ...

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Here, we present oxygen-deficient black ZrO<sub>2-x</sub> as a new material for sunlight absorption with a low band gap around ~1.5 eV, via a controlled magnesiothermic reduction in ...

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Oxygen-deficient BaTiO<sub>3</sub>- perovskite as an efficient bifunctional oxygen electrocatalyst ... and stationary applications for storing the clean energy obtained from wind, solar, and power ...

To explore the high thermal performance of the gas-fired decarburization power generation system with oxygen-enriched combustion (GDPGS-OC), the thermal performance ...

The solar-driven district energy systems (DES), solar cooling system, PV-coupled combined heat and power (CHP) systems, solar-driven (thermal and/or PV) combined ...

The results showed that the proposed system generated 26.3 MW of power, 137.3 MW of cooling, 21.4 MW of heating, 72 kg/h of hydrogen, and 3927 m<sup>3</sup>/h of freshwater ...

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