

# Molecular solar thermal storage system

What is molecular solar thermal energy storage?

Molecular solar thermal energy storage systems (MOST) offer emission-free energy storage where solar power is stored via valence isomerization in molecular photoswitches. These photoswitchable molecules can later release the stored energy as heat on-demand. Such systems are emerging in recent years as a vibrant

How does a molecular solar thermal system work?

This layer employs a molecular solar thermal (MOST) energy storage system to convert and store high-energy photons--typically underutilized by solar cells due to thermalization losses--into chemical energy. Simultaneously, it effectively cools the PV cell through both optical effects and thermal conductivity.

Can a molecular solar thermal energy storage system be a hybrid device?

Two main issues are (1) PV systems' efficiency drops by 10%-25% due to heating, requiring more land area, and (2) current storage technologies, like batteries, rely on unsustainably sourced materials. This paper proposes a hybrid device combining a molecular solar thermal (MOST) energy storage system with PV cell.

Can a molecular solar thermal system be combined with a PV cell?

This paper proposes a hybrid device combining a molecular solar thermal (MOST) energy storage system with PV cell. The MOST system, made of elements like carbon, hydrogen, oxygen, fluorine, and nitrogen, avoids the need for rare materials.

Can molecular photoswitches be used in solar thermal energy storage?

The calculated energy densities of the dimer and trimer systems of up to 927 kJ kg<sup>-1</sup> (257 Wh kg<sup>-1</sup>) and measured densities up to 559 kJ kg<sup>-1</sup> (155 Wh kg<sup>-1</sup>) greatly exceed the original targets of 300 kJ kg<sup>-1</sup> 15 highlighting the potential of applying molecular photoswitches in future solar thermal energy storage technologies.

How efficient is a solar thermal energy storage system?

The solar thermal energy storage efficiency ?experiment of the MOST system has been determined to reach up to 2.3%, representing the highest recorded efficiency to date. 34 Additionally, the inclusion of the MOST system as a non-heating temperature stabilizer with optical filter effect can further enhance the efficiency of the PV cell.

This thesis presents research efforts into a developing technology called molecular solar thermal energy storage (MOST, 28-30 also referred to as solar thermal fuels, 31 STF). Based on ...

The efficiency of photovoltaic (PV) solar cells can be negatively impacted by the heat generated from solar irradiation. To mitigate this issue, a hybrid device has been developed, featuring a solar energy storage and ...

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Abstract. Harnessing and storage of solar radiations employing molecular photoswitches are certainly of intense research interest en route to alleviate the increasing energy demand. The ...

The first key step in the molecular solar thermal energy storage system is the absorption of light by the parent molecule, which undergoes a reversible photoisomerization reaction to its corresponding metastable isomer. ...

Introduction Over the past couple of decades, there have been increasing interest and significant progress in the development of molecular solar thermal (MOST) energy storage systems. 1-5 These molecular systems capture solar photon ...

Status and challenges for molecular solar thermal energy storage system based devices Zhihang Wang, \*a Helen Ho&#168;lzel a and Kasper Moth-Poulsen \*abc Molecular solar thermal energy ...

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The development of solar energy can potentially meet the growing requirements for a global energy system beyond fossil fuels, but necessitates new scalable technologies for ...

The electrocyclic reactions, as represented by the norbornadiene (NBD)/quadricyclane (QC) couple, show promise for solar thermal storage due to their high storage enthalpy, low ...

Besides the established technologies to harvest and store solar energy, such as photovoltaics, batteries, or power-to-X tech-nologies, there are also very simple molecular ...

This review addresses so-called molecular solar thermal (MOST) systems, which appear very promising since they combine light harvesting and energy storing in one-photon one-molecule processes. The ...

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