Quadricyclane solar energy storage

What is molecular solar thermal energy storage?
Molecules that undergo photoinduced isomerization reactions that are capable of absorbing light, storing it as chemical energy, and releasing it as thermal energy on demand are referred to as molecular solar thermal energy storage (MOST) or solar thermal fuels (STF). Such molecules offer a promising solution for solar energy storage applications.

What molecule can be used for solar energy storage?
Such molecules offer a promising solution for solar energy storage applications. Different molecular systems have been investigated for MOST applications,such as norbornadienes,azobenzenes,stilbenes,ruthenium derivatives,anthracenes,and dihydroazulenes.

Can a polycyclic strained molecule (NBD) convert to quadricyclane (QC)?
The polycyclic strained molecule norbornadiene (NBD),which photoconvertsto quadricyclane (QC),is of great interest because it has a high energy storage density and the potential to store energy for a very long time. Unsubstituted norbornadiene has some limitations in this regard,such as poor solar spectrum match and low quantum yield.

Are photoswitches a viable energy storage system?
Photoswitches that can absorb and store solar energy and release it as heat on demand have been considered as candidates for MOST applications. These systems have attracted increasing attention in the last years due to their possible use in emission-free energy storage systems. (7-21)

Is norbornadiene a molecular energy storage system?
Due to its properties,the molecule pair norbornadiene (NBD) and quadricyclane (QC) appears auspicious concerning its feasibility as MOST energy storage system(see Section 1.2). MOST systems can also be considered as molecular photoswitches; 9 in this context,various systems are known in literature (see Scheme 1).

Who are the authors of photon energy storage in cyclic hydrazones?
Qianfeng Qiu,Sirun Yang,Mihael A. Gerkman,Heyifei Fu,Ivan Aprahamian,Grace G. D. Han. Photon Energy Storage in Strained Cyclic Hydrazones: Emerging Molecular Solar Thermal Energy Storage Compounds.

We describe for the first time the full reaction coordinate regarding the photoisomerization of red-absorbing norbornadienes (NBDs) to quadricyclanes (QCs). Our studies go beyond steady-state investigations by ...

In order to quantify the amount of solar power that a MOST system can store, the solar energy storage efficiency over the whole process needs to be estimated, which includes ...

Besides energy generation, its storage is a crucial aspect. One promising approach is to store energy from the

sun chemically in strained organic molecules, so-called ...

Norbornadiene-quadricyclane (NBD-QC) photoswitches are candidates for applications in solar thermal energy storage. This work demonstrates that, by modifying the rotational energy landscape of ...

Stilbenes (Fig. 2) are a class of organic compounds which undergo a E-Z photoisomerisation when exposed to light in the range 300-700 nm, making them interesting ...

For molecular solar thermal (MOST) systems, the energy storage density, energy conversion efficiency, and energy storage time are the major figures of merit, which can be ...

The shaded circles highlight the Norbornadiene (NBD, parent state, blue) and Quadricyclane (QC, isomer state, pink) forms. (For interpretation of the references to color in ...

Molecules that undergo photoinduced isomerization reactions that are capable of absorbing light, storing it as chemical energy, and releasing it as thermal energy on demand are referred to as ...

development of new technologies for energy storage is in high demand. Molecules that undergo photoinduced isomerization reactions that are capable of absorbing light, storing ...

Developing norbornadiene-quadricyclane (NBD-QC) systems for molecular solar-thermal (MOST) energy storage is often a process of trial and error. By studying a series of norbornadienes (NBD-R2) doubly substituted at ...

Norbornadiene-quadricyclane (NBD-QC) photo-switches are candidates for applications in solar thermal energy storage. Functionally they rely on an intramolecular [2+2] ...

Molecules that undergo photoinduced isomerization reactions that are capable of absorbing light, storing it as chemical energy, and releasing it ...

Norbornadiene-quadricyclane has been studied for solar energy storage since at least 1983, when the American Chemical Society published a paper aptly titled, ...

Using a variety of different ab initio quantum chemical methods, we report storage energies, absorption spectra, and reaction barriers for the release of stored energy for a series of bicyclic dienes. The bicyclic dienes are ...

Energy storage in molecular photoswitches: NBD based photoswitches combine solar energy conversion, storage, and release in a very simple one-photon one-molecule ...

Anne Ugleholdt Petersen, Anna I. Hofmann, Méritxell Fillols, Mads Mansø, Martyn Jevric,

Quadricyclane solar energy storage

Zhihang Wang, Christopher J. Sumby, Christian Müller, Kasper Moth-Poulsen "Solar energy storage by ...

We have investigated novel bicyclic diene molecular solar thermal energy storage systems that presently are the ones with the highest predicted energy density. Using a variety of different ab initio quantum chemical ...

The polycyclic strained molecule norbornadiene (NBD), which photoconverts to quadricyclane (QC), is of great interest because it has a high energy storage density and the potential to ...

Brummel, O. et al. Photochemical energy storage and electrochemically triggered energy release in the norbornadiene-quadricyclane system: UV photochemistry and IR spectroelectrochemistry in a ...

As the availability of solar energy varies drastically in space and time, however, energy storage is the primary challenge in our transition to a renewable energy system. ...

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