

What is photostimulated luminescence (PSL)?

According to these conditions, photostimulated luminescence (PSL), which is a luminescence response to optical stimulation, seems to be an ideal candidate. Generally, a PSL material contains emitters for optical detection and deep traps as optical storage units.

What is a good PSL medium for optical storage?

Generally, as an ideal PSL medium material for optical storage, it should store energy under ultraviolet or near-ultraviolet irradiation and the irradiation energy can be stably stored for a sufficiently long time. Furthermore, under stimulation of infrared or near-infrared laser, it should emit visible light in form of energy release.

Can nanostructured PSL glass be used for optical storage?

Jin and Hu greatly increased the capacity of optical storage by tailoring traps of PSL materials. In 2020, Lin and Wang reported high-density 3D optical storage based on nanostructured PSL glass. However, to date, there have been few reports on optical operation based on a PSL material. Fig. 1.

How can a superresolution microscopy increase optical storage density?

In particular, the near/far superresolution microscopy has been applied to increase the optical storage density by breaking the diffraction limit of light, and optical multiplexing has been introduced to expand the physical dimension of the optical storage medium.

What is the storage stability of $\text{Lu}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$ material?

(1) Low storage stability: although the trap depth of the $\text{Lu}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$ material reaches 1.34 eV, which is the material with the deepest trap depth reported so far, the PSL storage stability of the $\text{Lu}_3\text{Al}_5\text{O}_{12}:\text{Ce}^{3+}$ material is still insufficient at room temperature, so that it needs to be stored in a low temperature and dark condition.

Can PSL materials perform optical operations?

In fact, PSL materials have the inherent capability of performing optical operations, which are optical realizations of digital computers. As a typical example, a Boolean logic operation basically consists of two inputs and a single output, where the variables of an expression represent logical 1 and 0.

Phosphor materials exhibiting long-lasting phosphorescence or photostimulated luminescence (PSL) are interesting materials for accumulation and storage of photon-derived energy [136]. These materials have potential applications in road markings, electrical power-free illumination, information storage devices, and safety labeling applications in ...

The operation of microgrids, i.e., energy systems composed of distributed energy generation, local loads and

energy storage capacity, is challenged by the variability of intermittent energy sources and demands, the stochastic occurrence of unexpected outages of the conventional grid and the degradation of the Energy Storage System (ESS), which is strongly ...

The conventional train network is a well-established railway infrastructure that relies on a centralized power supply system to provide traction power for train operations is shown in ...

Energy storage competitiveness is ubiquitously associated with both its technical and economic performance. This work investigates such complex techno-economic interplay in the case of Liquid Air Energy Storage (LAES), with the aim to address the following key aspects: (i) LAES optimal scheduling and how this is affected by LAES thermodynamic performance (ii) ...

The integration of renewable energy systems into the electric grid has become increasingly inevitable to satisfy the energy needs and reduce the use of fossil fuels [1]. Yet, incorporating renewable energy sources is faced by different challenges related to reliability, stability, and optimal operation of this latter [2, 3]. To deal with the unpredictability of energy ...

Despite the long afterglow luminescence materials have great application prospect in security signs and emergency signalization [1], persistent pigments [11], optical storage media and solar cell [12], photocatalysis [10, 13], sensors [14], fingerprint detection [15], vivo imaging [16], and drug carriers [17]. The most researches on the long afterglow luminescence materials ...

Energy Solutions and Smart Grids. Beyond vehicles, Tesla's technologies extend to energy storage and solar energy. Products like the Powerwall, Powerpack, and Megapack are integral to decentralized power ...

Electrochemical analysis reveals the specific capacitance range of NPs is from 26 to 52.5 F/g. The energy density is found to be highest i.e. 1419 Wh/g for 7 mol% Co doped CeO₂ NPs. Collectively, our research suggests a promising avenue for the practical application of these NPs in advanced energy storage devices.

An alternative solution consists of directly using PCMs with higher thermal conductivity and latent heat. As a general rule, the heat of fusion of materials increases with melting temperature [1], [7]; thus, there is an interest on moving towards higher melting point PCMs. However, in LHTES for power generation there is a maximum temperature imposed by ...

Optical storage based on photostimulated luminescence (PSL) shows significant advantages and is considered one of the most promising next-generation advanced storage ...

In linear dielectric polymers (the electric polarization scales linearly with the electric field, such as polypropylene, PP), the electrical conduction loss is the predominant energy loss mechanism under elevated temperatures and high electric fields [14, 15] incorporating highly insulating inorganic nanoparticles into

polymer dielectrics has been proved effective in the ...

This book discusses the design and scheduling of residential, industrial, and commercial energy hubs, and their integration into energy storage technologies and renewable energy sources. Each chapter provides theoretical background ...

High efficient energy storage devices for both thermal energy and light energy are scarce in the development of modern society to reduce energy consumption. In this work, a novel self-luminous wood composite based on phase change materials (PCMs) with superior thermal energy storage and long afterglow luminescence (LAL) materials with excellent ...

In this work, the optical energy storage properties of the efficient blue emitting $\text{Sr}_2\text{MgSi}_2\text{O}_7:\text{Eu}^{2+}, \text{R}^{3+}$ persistent luminescence materials were studied by a combination of ...

Solar-absorbing energy storage materials demonstrating superior solar-thermal conversion and solar-persistent luminescence conversion towards building thermal management and passive illumination. ... and the optimal concentrations of 100 ppm or 200 ppm are recommended for operation during winter time.

Energy storage is nowadays recognised as a key element in modern energy supply chain. This is mainly because it can enhance grid stability, increase penetration of renewable energy resources, improve the efficiency of energy systems, conserve fossil energy resources and reduce environmental impact of energy generation.

Optical storage based on photostimulated luminescence (PSL) shows significant advantages and is considered one of the most promising next-generation advanced storage technologies. ... as an ideal PSL medium material for the optical storage, it should store energy under ultraviolet or near-ultraviolet irradiation and the irradiation energy can ...

Since traditional fossil energy sources are harmful to the environment, it is urgent to develop new renewable energy sources and find scientific and efficient energy storage methods [1], [2]. Dielectric energy storage capacitors with fast charge/discharge speed and high power density can regulate intermittent renewable energies [3]. Dielectric ceramics, as the core part of ...

Fig. 2 (a) Post-combustion technology involves cooling hot flue gas before directing it to an absorber unit that typically contains a monoethanolamine solvent as the traditional sorbent. The CO_2 -rich absorbent is then sent to a stripper ...

This paper mainly studies the preparation technology and properties of energy-storing luminescent plastic. The colorless and colored energy-storing self-luminous plastics were prepared by using epoxy resin as the carrier, adding long-acting noctilucent powder into epoxy resin to fully mix and adding phenol-4-sulfonic acid to cure.

In 2021, about 2.4 GW/4.9 GWh of newly installed new-type energy storage systems was commissioned in China, exceeding 2 GW for the first time, 24% of which was on the user side [].Especially, industrial and commercial energy storage ushered in great development, and user energy management was one of the most types of services provided by energy ...

Life-cycle economic analysis of thermal energy storage, new and second-life batteries in buildings for providing multiple flexibility services in electricity markets ... Because the lifespan of battery storage is around 9-10 years, after that only TES storage system is in operation and generates revenues. It can be seen that hybrid storage ...

The energy storage-luminescence multifunctional ecofriendly relaxor ferroelectric thin films of $\text{Er}^{3+}/\text{Yb}^{3+}$ -codoping BNT-SBT are fabricated using chemical solution technology. ... The time-resolved fluorescence analysis was done for green and red emissions, and it was observed that the time decay increased for higher dopant concentrations ...

Organic Persistent Luminescence. The D-A-D wedge-shaped TADF emitter TCN, incorporating a strong electron-accepting segment, serves as the guest, while the electron ...

Energy Storage and Saving (ENSS) is an interdisciplinary, open access journal that disseminates original research articles in the field of energy storage and energy saving. The aim of ENSS is to present new research results that are focused on promoting sustainable energy utilisation, improving energy efficiency, and achieving energy conservation and pollution reduction.

EPCMs have gained significant attention among energy storage materials because of their ability to store and release a large amount of heat during phase change, and their ease of integration into existing systems. EPCMs have a wide range of applications, including thermal energy storage [118], thermal management [119], and smart textile [120] ...

Laporte"s rule typically limits the excitation of lanthanide ions, as the 4f-4f transitions are forbidden [37].However, a suitable "antenna" can significantly sensitize lanthanide ions through ligand-to-metal energy transfer (LMCT) processes [38] nsequently, some Ln-MOFs can emit dazzling light under ultraviolet light excitation such as Eu-MOFs (red light) and ...

Optical storage based on photostimulated luminescence (PSL) shows significant advantages and is considered one of the most promising next-generation advanced storage technologies. However, to realize PSL-based optical computing, further implementation of PSL-based optical operation is still required.

The ongoing energy transition is leading to a substantial increase in the installed capacity of Renewable Energy Sources (RESs) (Hansen, Breyer, & Lund, 2019) Germany, for example, the installed capacity has

more than doubled from 56,545 MW in 2010 to 125,386 MW at the end of 2019 (IRENA, 2020) total, RESs supplied almost 43 percent of Germany's ...

Various parameters affect the remaining energy of storage systems throughout their lifetime, 4 including operating conditions like temperature, 5 charging rate (C rate), 6 depth of ...

The thermogravimetric studies over temperature range 30-800 °C reveal the decomposition and thermal constancy of prepared graphitic structure. It is found from the electrochemical analysis that coke derived GrO exhibited ...

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