



Using solar energy to store lasers

Large solar arrays in geostationary orbit collect solar energy and beam it back to Earth via microwaves as a continuous source of clean energy. However, implementing this technology is not so simple.

Herein, we report significant improvements in end-side-pumped solar laser collection efficiency and beam brightness using a novel 1.5-m-diameter compound solar concentrator combining a Fresnel ...

We have developed a fully planar solar-pumped fiber laser using a solid-state luminescent solar collector (LSC). This laser does not use any focusing device, such as a lens ...

Path to easier recycling of solar modules Use of lasers to melt edges of glass together eliminates troublesome polymers Date: May 2, 2024 Source: DOE/National Renewable Energy Laboratory

An energy cycle using solar power and metals has been proposed. High repetitive laser pulses are generated by a solar-pumped laser or a laser generated using solar power, and the laser pulses are irradiated to metal oxides in liquid. We can obtain reduced metal nanoparticles with this method, and solar power is effectively stored as chemical energy. We ...

We report the recent progress of our proposed renewable energy cycle based on magnesium and solar-energy-pumped laser. The solar energy is used to recycle the used magnesium, MgO, to recover new magnesium and magnesium is used as fuel-cell battery. The batteries for the cell phone, automobiles and others have already been developed and ...

The optical conversion of incoherent solar radiation into a bright, coherent laser beam enables the application of nonlinear optics to solar energy conversion and storage.

A solar-pumped laser (or solar-powered laser) is a laser that shares the same optical properties as conventional lasers such as emitting a beam consisting of coherent electromagnetic radiation which can reach high power, but which uses solar radiation for pumping the lasing medium. This type of laser is unique from other types in that it does not require any artificial energy source.

Solar-pumped laser cavity with two highly reflecting mirrors M1 and M2, a cylindrical laser medium LM (radius r ; R), length L ; L), and a power-conversion cell P.

For 249 W incoming solar power at an irradiance of 850 W/m², 11.2 W multimode solar laser power was measured, corresponding to the record solar-to-laser power conversion efficiency of 4.50% ...

recycle it. We proposed to use lasers to recycle magnesium. Magnesium compounds can be extracted either from the ocean or mine in solid form. These compounds are refined by using lasers as shown in Fig.1. The



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lasers are directly solar-energy-pumped laser ([2]-[7]) or semiconductor lasers pumped by electricity from various sources. Refined

This involves collection of solar energy in outer space, converting it to a laser beam, and sending it down to Earth where it can be utilized to generate electricity using solar cells.

At an incoming solar power of 600 W, the Ce:Nd:YAG solar laser achieved 23.6 W/m² collection efficiency, 4.4% slope efficiency and 2.8% solar-to-laser power conversion efficiency, which are 1.57 ...

In the Sept. 30 Applied Physics Letters, Gordon's team reports using its solar device to produce laser-quality lesions on chicken breasts. Gordon has now teamed up with a surgeon to test the ...

The use of space for power generation is strongly recommended because it offers highest energy conversion efficiency sinking the heat as an energy dissipation makes best use of solar energy and lowers the prepaid costs (Lior (Citation 2001)). The applications of using such a space power in the space are many such as the space communication, satellite and space ...

Solar lasers have a great potential to drive fossil-fuel-free energy cycles for electricity generation or chemical energy storage. 21-24 Magnesium has a great potential for green energy cycles as it is the eighth ...

This paper illustrates details about the solar-powered solid-state lasers, which have the advantage of inherent high energy density and compactness, relatively low pumping threshold, and potential ...

Mg can then be regenerated, e.g. by using a solar-energy pumped laser. 53, 54 To confirm that a water proton was reduced to a Hc radical by an electron from Mg, CO₂ conversion was carried out ...

However, the space community was already proposed and investigate several designs prior to the nuclear disaster. The first design, proposed and patented by Peter Glaser in the late 1960s [6], [7], consisted of a system that collects and converts solar radiation energy to electric energy using Geosynchronous Earth Orbit (GEO) based satellite ...

Of the variety of solar energy conversion schemes that have been explored, the conversion of solar flux to coherent laser radiation is a relative newcomer. Actually, demonstration of solar pumped lasing goes back to the 1960s. However, the number of groups engaged in solar laser research is extremely small [2, 3]. Part of the reason for this is ...

Lasers use electrical power (or even another laser) to add energy to the gain medium, a substance that can engage in stimulated emission. The gain medium can be a solid, liquid, or gas.

At ICFO, Barcelona, the first tabletop ultrafast X-ray absorption measurements were recently demonstrated using a high harmonic generation (HHG) laser source in the water window. This source is now available



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through the Laserlab access programme and is particularly suited for looking at excitations and structure of organic solar cell materials.

By creating a highly efficient means of converting the sun's energy into laser light, such lasers may turn out to be the missing piece in a new energy generation jigsaw, ultimately helping...

In this paper, we investigate the role of solar laser technology as a pivotal element in advancing sustainable and renewable energy. We begin by examining its wide-ranging applications across diverse fields, including remote communication, energy storage through magnesium production, and space exploration and communication. We address the current ...

By using a similar compact solar laser in 2019, Suzuki et al. reported continuous oscillation of solar laser exceeding 6.5 h, being the longest measurements of solar laser power variation as a function of time. During these experiments, maximum solar laser power of about 12 mW was registered between 12:00 and 13:00 and kept going over 10 mW ...

Solar pumped lasers (SPL) can be used to drive reactions that store solar energy in chemical form 1, or perform efficient wavelength conversion of sub-bandgap sunlight, potentially increasing the ...

The cross energy transfer mechanism under violet laser diode pumping has been analyzed and the possible energy transfer mechanisms have been proposed using the various energy levels of the dopant ...

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