Advanced Research Projects Agency • ENERGY

HEATS PROJECT

MIT

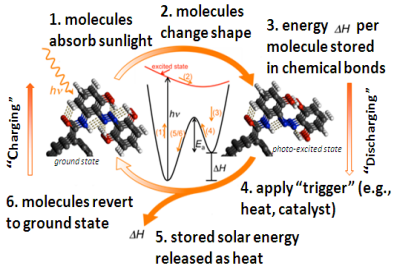
SOLAR THERMAL ENERGY STORAGE DEVICE

PROJECT TITLE:	HybriSol Hybrid Nanostructures for High-Energy-Density Solar Thermal Fuels		
ORGANIZATION:	Massachusetts Institute of Technology (MIT)	LOCATION:	Cambridge, MA
PROGRAM:	HEATS	ARPA-E AWARD:	$2,966,654
TECH TOPIC:	Thermal Fuel	PROJECT TERM:	1/9/12 – 1/8/15
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/HEATS.aspx		

CRITICAL NEED

Two of the most pressing challenges we face today are addressing our expanding energy needs and reducing our greenhouse gas emissions from the use of fossil fuels. Solar energy offers a promising solution to both challenges because of its abundance and lack of greenhouse gas emissions. However, a transformation from fossil fuels to solar energy requires efficient and cost-effective processes to collect, store, and transport our most plentiful—but intermittent—source of energy. One promising approach is the production of synthetic fuel that can harvest and store the sun's energy in chemical form via rearrangement of photoactive molecules —allowing solar energy to be easily transported and stored in the form of heat on demand.

PROJECT INNOVATION + ADVANTAGES



MIT is developing a thermal energy storage device that captures energy from the sun; this energy can be stored and released at a later time when it is needed most. Within the device, the absorption of sunlight causes the solar thermal fuel's photoactive molecules to change shape, which allows energy to be stored within their chemical bonds. A trigger is applied to release the stored energy as heat, where it can be converted into electricity or used directly as heat. The molecules would then revert to their original shape, and can be recharged using sunlight to begin the process anew. MIT's technology would be 100% renewable, rechargeable like a battery, and emissions-free. Devices using these solar thermal fuels—called Hybrisol—can also be used without a grid infrastructure for applications such as de-icing, heating, cooking, and water purification.

IMPACT

If successful, MIT's technology could significantly decrease fossil fuel consumption and greenhouse gas emissions, enabling clean solar energy to be accessible to homeowners and businesses 24 hours a day.

- SECURITY: Greater use of thermal fuels would reduce U.S. reliance on fossil fuels—strengthening America's energy security. Lightweight, portable, solar-rechargeable devices based on solar thermal fuels would also have important military applications.
- ENVIRONMENT: Thermal fuel technologies typically do not emit greenhouse gases and can also reduce fossil fuel consumption—helping curb production of carbon dioxide emissions that contribute to global climate change, while enabling the development of transformational technologies for a range of applications.
- ECONOMY: Thermal fuels could spur economic growth in new thermal fuel-related industries in the U.S.
- JOBS: As these new technologies develop, there will be new job opportunities in design and manufacturing for thermal fuels and their wide-ranging applications.

CONTACTS

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