Solar thermal energy palikir

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A four-year research project by several German universities is exploring the release of molecules involved in molecular solar thermal (MOST) energy storage. They plan to modify the molecules to achieve the best possible properties for the storage technology.

Still in its infancy, MOST energy storage is described as a method for storing solar energy similar to a heat battery but comprising a large number of synthetically-created molecules.

The MOST molecules undergo structural changes on contact with sunlight, a process known as photo-induced reaction. The structural change sees the molecules absorb energy under the influence of light, which can be released again later as the molecules possess an on-off switching, which leads to them being referred to as photoswitches.

"When exposed to light, all three switch from their ground state to a higher-energy storage state, thus changing their molecular structure and in some cases also their color," said Goethe University in a news release.

"All the steps - conversion, storage and release of energy - are united in a single molecule," explained Josef Wachtveitl, head of the Wachtveitl group, which is involved in the project.

Goethe University researchers found that MOST energy storage outperforms conventional solar heat storage in direct comparisons. The molecules, which must be activated to release heat, enable energy to be delivered on demand. The system, entirely CO2-neutral through storage, conversion, and release, allows heat to be stored for weeks or months as needed.

"MOST gives us much more flexibility for storing solar heat," Wachtveitl said. He added that as all processes occur inside a single molecule, MOST heat storage systems can be set up anywhere, negating the need for a large production plant.

Work on the Formost project will continue, with researchers looking at modifying molecules to achieve the best properties for MOST storage. This will include looking to modify the photoswitches so they can absorb visible light, as they currently tend to absorb only in the UV range where it borders visible light, and assessing the charge processes in photoswitches.

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