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Novel solar energy harvesting options based on solution-processable inorganic/organic hybrid materials

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The growing demand for energy and increasing concerns for the effect of the excessive abuse of fossil fuels on the environment force the scientific world to search for alternative, clean and safe energy sources. Finding ways to harvest solar energy is thereby one of the most appealing options. Here, we present a novel approach that exploits the versatile properties of recently developed, photoactive organic/inorganic hybrid fluids based on titanium oxide hydrates and polyalcohols for the production of versatile solar fuels. We will show that such systems can absorb light in the UV-near visible wave-length range. The sunlight's energy is then converted into chemical energy in the form of reduced titanium species, which can be re-oxidised by oxygen when required. Therefore, the absorbed energy is stored as long as oxygen is excluded by the hybrid system. We, furthermore, demonstrate that once discharged, the fluid can be activated again by exposing it to sunlight and recycled – a property that is important technologically. The same hybrids can also be exploited to produce structures that permit efficient management of light. We will illustrate the potential of this class of materials based on some of our recent approaches to fabricate light-scattering and light in-coupling structures, and discuss future opportunities they open up.