Photocatalyst architectures from biologically inspired self-assembly

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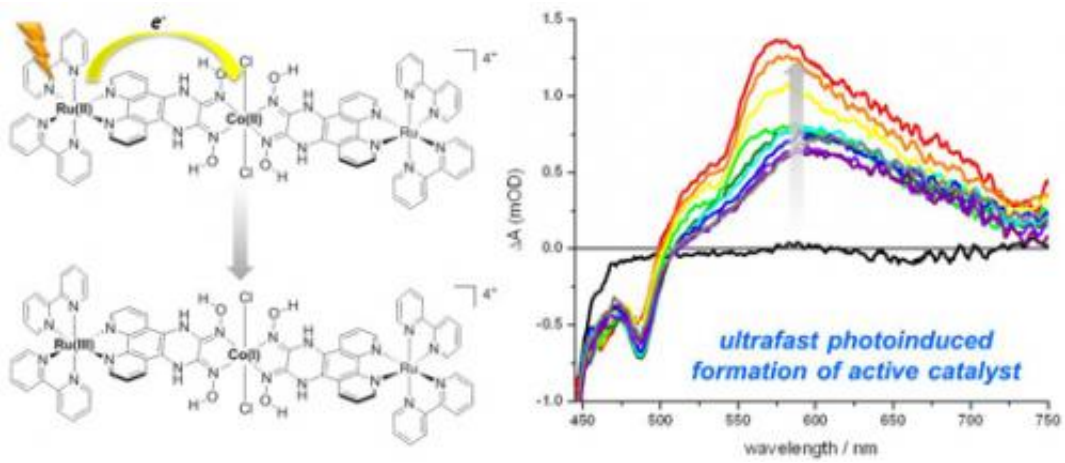

Center for Nanoscale Materials' users from the Solar Energy Conversion group of Argonne's Chemical Sciences & Engineering Division (CSE) have used biologically inspired self-assembly to build photocatalyst architectures with highly integrated light-harvesting and catalyst components for light-activated hydrogen production. A key challenge in the design of new photocatalysts for the conversion of solar energy to chemical fuels is finding just the right connection between components to facilitate and stabilize the relevant electronic and chemical transformations.

Work recently published in Phys. Chem. Chem. Phys. and highlighted as

a HOT article by the editors describes a transformational strategy for the self-assembly of common and highly active cobalt-based H2 catalysts with light-harvesting components and importantly, demonstrates the very first time the mechanistically critical oxidation state has been generated using an ultrafast visible light source.

Time-resolved optical spectroscopy, performed in part at the Center for Nanoscale Materials, has enabled precise mapping of the electron transfer kinetics following visible excitation and shows that the active catalyst state decays through multiple energetic states within the photosensitizer-catalyst connection. This combination of new bio-inspired synthesis and high-resolution physical characterization will guide next generation designs for efficient solar energy conversion.

More information: A. Mukherjee et al., *Phys. Chem. Chem. Phys.*,15, 21070-21076 (2013).

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