Technology Opportunity, Ref. No. UZ-19/038

A stable, cost-efficient hybrid catalyst system for a water photooxidation

A novel catalyst system is presented which combines the advantages of soluble molecular catalysts with fully exposed active sites and the benefits of solid-state materials with unique physicochemical properties. It is stable, cost-efficient and shows a high performance.

Keywords Water photooxidation, catalyst

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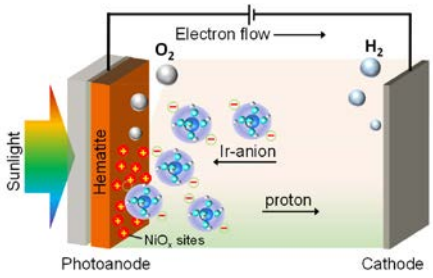
Reference Atomically dispersed hybrid nickel-iridium sites for photoelectrocatalysis, Nature Communications 8, 1341 (2017)

Background Most active catalysts for photoelectrocatalysis are Ir- and Ru-based films and particle materials. However, these catalysts are not stable in strong alkaline condition under which the water oxidation has high reaction kinetics, and their atomic efficiency is low owing to a large amount of non-available precious metal atoms in the core region of the structures, which leads to high costs.

Invention The new catalyst system consists of a semiconductor substrate which is covered by dispersed Ni-ions. The Ir is solved in the electrolyte (as [Ir(OH)6]2-) and binds to the NiOx during the photoelectrochemical process (in situ).



This system combines the advantages of soluble molecular catalysts with fully exposed active sites and the benefits of solid-state materials with unique physicochemical properties: It has a) maximum atomic efficiency (all atoms are involved in the catalysis) and b) is stable in strong alkaline electrolyte, under which the water oxidation has high reaction kinetics. The new cell is therefore stable, cost-efficient and shows a high performance.

Patent Status Patent filed

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