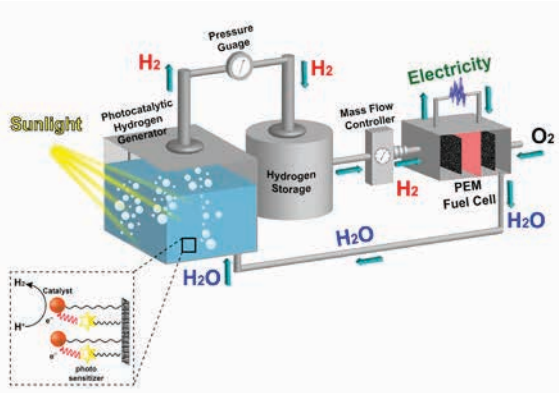
Natural Sunlight-Driven H_2 Generation from Water



Problem Statement: Using hydrogen as a fuel emerged as one of the possible avenues for minimising carbon dioxide emissions due to burning fossil fuels. The direct storage of readily available solar energy into an H-H bond (chemical form) is a key step for an H_2-driven power generation methodology. An efficient, sustainable, and scalable water to H_2 production technology that can enable a carbon-neutral energy infrastructure is missing. Currently, no product for direct H_2 production from solar irradiation is available in the Indian market. The solar to electricity converters and electrolysers are available separately; however, their combination doesn't provide an energy-efficient and readily-usable solution.

Uniqueness of the Solution: The team aims to construct a prototype of a sustainable hydrogen-gas-(H_2)-generator that can be directly linked with a fuel cell for regulated electricity production. The H2 generator will be functional in neutral water with solar irradiation under the most practical conditions (temperature 15-80°C, in the presence of aerial oxygen, without the usage of any hazardous organic solvents or acids).

Current Status of Technology: The team has established the proof of concept and validated the assembled components in the laboratory environment.

Societal Impact: The proposed sunlight-driven electricity generator is environmentally friendly as it produces water as the only by-product. It is energy efficient because it converts solar energy into an intermediate chemical vector (H_2 gas) which can be transformed into electricity as needed. This reaction pathway improves energy efficiency and regulation in solar to electricity production compared to conventional solar cells with no storable intermediates.
It will also be economical since it will utilise an earth-abundant transition element as the H2 production catalyst and biodegradable components. Also, the final product of the process, water, will be recycled back to the photocatalytic H_2 generator unit, making electricity generation cheaper than the conventional solar-panel systems.

Patent(s): Nil

Relevant Industries: Power & Energy sector, Petroleum and Chemical industries.

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