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## Review on hydrogen production technologies from solar energy

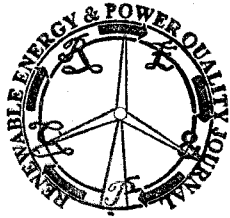
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**Abstract.** This article overviews the available technologies for hydrogen generation using solar energy as main source. Photochemical, electrochemical and thermochemical processes for producing hydrogen with solar energy are analysed from a technological and economical point of view. It is concluded that developments of improved processes for hydrogen production via renewable feedstock are likely to continue in order to reach competitive hydrogen production costs. Hybrid thermochemical processes where hydrocarbons are exclusively used as chemical reactants for the production of syngas and the concentrated solar radiation is used as a heat source, represent one of the most promising alternatives: they combine conventional and renewable energy representing a proper transition towards a solar hydrogen economy.

### Keywords

Hydrogen generation, solar energy, electrochemical process, photochemical process, thermochemical process.

### 1. Introduction

The actual energetic situation, with pollution problems, climate change, international conflicts motivated by the resource accessibility, and the run out of fossil fuels, precise new energy production technologies. Among them, those based in hydrogen as energy currency play an important role. In the long term is expected that hydrogen will replace fossil fuels giving way to a hydrogen economy.

Clean hydrogen production from renewable energy is, no doubt, an important aspect to take into account inside the real launch of this gas as a future energy

carrier. Our society demands more and more a "sustainable development", but it has to be remarked that hydrogen technologies can be or not clean technologies depending on their sources.

Hydrogen production from renewable energies is becoming more prominent. Hydrogen generation from renewable energies emerge as a proper way to store, as chemical energy, the energy coming from the sun.

There are basically three pathways, and their combinations, for producing hydrogen with solar energy: electrochemical, photochemical, and thermochemical. In this paper, their different technologies are reviewed and a brief economical comparison among them is carried out.

This paper represents an abstract of a previous work [1]. Due to the great amount of them, original references are not included here. Please refer to [1] to consult them.

### 2. Photochemical Processes

Photochemical processes use solar light to produce the hydrolysis of water. Nowadays two procedures are known: the photoelectrochemical and the photobiological.

In the photoelectrochemical process, water is split into hydrogen and oxygen in a single step and on a single device. This process differs to a conventional process where solar energy and electrolysis are used independently to separate water components.