A Project in the Framework “Nextgenerationeu”: Sustainable Photoelectrochemical Hydrogen Evolution - SERGIO

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Abstract : The exploration of solar energy for the photoelectrochemical splitting of water into hydrogen and oxygen has been extensively researched as a means of generating sustainable H_2 fuel. However, despite these efforts, commercialization of this technology has not yet materialized. Presently, the primary impediments to commercialization include low solar-to-hydrogen efficiency (2-3% in PEC with an active area of up to 10-15 cm^2), the utilization of costly and critical raw materials (e.g., $BiVO_4$), and energy losses during the separation of H_2 from O_2 and H_2O vapours in the output stream. The SERGIO partners have identified an advanced approach to fabricate photoelectrode materials, coupled with an appropriate scientific direction to achieve cost-effective solar-driven H_2 production in a tandem photoelectrochemical cell. This project is designed to reach Technology Readiness Level (TRL) 4 by validating the technology in the laboratory using a cell with an active area of up to 10 cm^2, boasting a solar-to-hydrogen efficiency of 5%, and ensuring acceptable hydrogen purity (99.99%). Our objectives include breakthroughs in cost efficiency, conversion efficiency, and H_2 purity.

Keywords : photoelectrolysis, green hydrogen, photoelectrochemical cell, semiconductors
Conference Title : ICHP 2024 : International Conference on Hydrogen Production
Conference Location : Dubrovnik, Croatia
Conference Dates : October 03-04, 2024