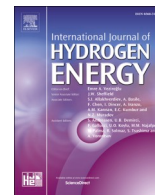




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journal homepage: www.elsevier.com/locate/heGreen hydrogen production through photocatalytic seawater splitting on MS₂/TiO₂ (M=Ni/Co/Sn) nanocomposites over simulated solar irradiationSivagowri Shanmugaratnam^{a,b,**}, Punniamoorthy Ravirajan^b, Yohi Shivatharsiny^{b,c,***}, Dhayalan Velauthapillai^{a,*}^a Faculty of Technology, Environment and Social Sciences, Western Norway University of Applied Sciences, P.O. Box 7030, 5020, Bergen, Norway^b University of Jaffna, Jaffna, 40000, Sri Lanka^c Augustana University, Sioux Falls, SD, 57197, USA

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ABSTRACT

Green hydrogen will play an important role in reducing carbon emission in sectors like transportation, power supply, and industry. However, for it to become competitive technology, the costs related to hydrogen production must be reduced. Photocatalytic hydrogen production is one of the green hydrogen production methods that have the potential to become cost effective. So far, photocatalytic water splitting has mainly focused on hydrogen production from pure water systems, but it is practically attractive to study methods for seawater systems, which will make better use of available natural resources. In this study, we focus on the synthesis and characterization of a variety of metal dichalcogenide-embedded titanium dioxide (NiS₂/TiO₂, CoS₂/TiO₂, SnS₂/TiO₂) nanocomposite materials as photocatalysts for seawater splitting. The materials were synthesized using a facile hydrothermal method and were used for simulated seawater, seawater and deionized water splitting with 4 h of simulated solar illumination. The amounts of 48.11, 24.94, 15.04, and 2.78 mmol g⁻¹ hydrogen were successfully produced with NiS₂/TiO₂, CoS₂/TiO₂, SnS₂/TiO₂, and pristine TiO₂ nanomaterials, respectively. Highest amount of H₂ with NiS₂/TiO₂ photocatalyst can be attributed to the low bandgap of NiS₂, which acts as a co-catalyst. Our study clearly demonstrates that low-cost, noble-metal-free nanocomposite photocatalysts could be promising candidates for realizing efficient solar-to-hydrogen conversion from seawater splitting.