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Enhancement of a Bench Scale Parallel Plate Photoelectrochemical Reactor for Hydrogen Production from Sulphured Water

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Extended Abstract

The search for suitable photoelectrochemical reactor designs has been broadened recently due to the application of this technology to the treatment of wastewater. The configurations that have been proposed for this purpose range from parallel plates, fluidized bed, tubular and fiber optic type, among others[1], [2].Carver *et al*. [3] determined that the configurations that met the main criteria for the design of this type of reactor are tubular and parallel plate configurations.

This paper presents the modification of a parallel plate photoelectrochemical reactor (UIS-GIMBA 1.0) and its evaluation in hydrogen production from sulphured water. For the different tests carried out, the reactors were coupled to a bench scale flow system to evaluate their performance in the production of hydrogen from water doped with sodium sulfide and sodium sulfite, driven the reactions to obtain a higher amount of hydrogen. Sulfide concentration and hydrogen production were monitored for four hours of operation, in order to correlate oxidation and reduction processes within the reaction system. The phoanodes used for this test were prepared to obtain a heterojunction of Bi_2O_3-Bi_2S_3 supported on a grade 2 titanium mesh, as cathode a nickel-plated grade 2 titanium mesh was used. The photoelectrochemical system allowed us to corroborate how the different changes performed on the UIS-GIMBA 1.0 photoelectrochemical reactor affected the amount of hydrogen detected.

Within the results obtained, hydrogen production is identifiable from the beginning of operation for the UIS-GIMBA 1.1 reactor while for the UIS-GIMBA 1.0 reactor it requires about 30 minutes to be detectable for the system. This may indicate that modifications made to the reactor design allow to eliminate stagnant areas present in the initial reactor or that these modifications promote the detachment of hydrogen bubbles more easily by reducing the growth time of the bubbles.

References

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