In recent years, the amount of research in renewable energy has been increased due to the necessity to overcome the effects of global warming and the large rate of air pollutants released to our atmosphere as a result of everyday human activities. Many approaches can be taken in order to contribute to the development of new clean and renewable technologies, and it is of great importance to focus on the development of a viable and environment-friendly energy source. The main purpose of this research is to study the viability of photocatalytic water splitting for hydrogen production, using commercial Zinc-Aluminum-Iron alloy substrates coated with Iron oxide nanostructures and doped with different levels of Zn-Al. The nanostructured coating is synthesized via electrodeposition of metallic salts dissolved in water as cell electrolyte. SEM images let us visually analyze the behavior of the redox process on the electrodes, and with EDS was found that Zinc-Aluminum is released due to electrodeposition and acidic environments. The released Zinc and Aluminum can be used for doping of iron oxide nanostructures or as co-catalyst on the coating over the substrate. Actual EDS-SEM data reveals incorporation of Aluminum structures on a thick iron coat and the creation of Iron dendrite-like structures due to material release on auxiliary electrodes. By using XRD, the phase and structure of the material is obtained. Finally, each sample is tested on a sweep voltammetry to measure the photocurrent activity.

**Keywords:** Photocatalysis, Electrodeposition, Iron oxide

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