**SYNTHESIS OF NOVEL C-QDs/BiFeO3/BiVO4TERNARY NANOCOMPOSITE FOR PHOTOELECTROCHEMICAL HYDROGEN PRODUCTION.**

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**ABSTRACT**

During the last years, semiconductor photocatalysts have attracted significant attention because of their use in water purification from organic and inorganic pollutants and hydrogen production from water splitting using solar energy [1]. Alternatively, hydrogen can be generated from the decomposition of organic pollutants in water through photoelectrocatalysis, leading to a more efficient process [2]. Βismuth-based semiconductor oxides are considered as an essential category among a wide range of visible-light responsive photocatalysts, especially BiVO4 semiconductors with a band gap of approximately 2.3 eV. In order to boost the photoelectrochemical (PEC) performance of BiVO4 photoanodes and reduce quick recombination of photoinduced charge carriers, the formation of heterojunctions with metal oxide semiconductors is recommended. Recently, perovskite-type BiFeO3 has received huge scientific attention due to its excellent multiferroic properties, narrow band gap energy (2.2 eV) and high physical and chemical stabilities. When a n-type BiVO4 and a p-type BiFeO3 are combined, the photo-induced electrons from the conduction band of BiFeO3 are facilely transferred to the conduction band of BiVO4 [3]. Simultaneously, surface modicification of photoanode materials constitutes a commonly applied strategy to enhance their PEC activity. It has been proven that the incorporation of carbon quantum dots (C-QDs) increases oxygen vacancies (Ov) density, thus remarkably boosts PEC activity [4].

Inspired by the above mentioned reasons, a ternary C-QDs/BiFeO3/BiVO4 nanocomposite was synthesized. The obtained nanocomposite was characterized by several techniques and used as photoanode electrode for the PEC hydrogen production linked to the oxidation of compounds found in wastewater. For this purpose, alcohols, sugars and polyols have been used as target substances and the amount of generated hydrogen was measured via gas chromatography.

**KEYWORDS:** photoelectrochemical cell, hydrogen production, BiVO4, BiFeO3, carbon quantum dots.

**REFERENCES**

[1] V. M. Daskalaki, M. Antoniadou, G. L. Puma, D. I. Kondarides, P. Lianos (2010). *Environ. Sci. Technol.* 44 (19): 7200–7205.

[2] P. Lianos, N. Strataki, M. Antoniadou (2009), *Pure Appl. Chem.* 81 (8): 1441–1448.

[3] B. Samran, S. lunput, S. Tonnonchiang, S. Chaiwichian (2019), *Phys. B: Condens. Matter* 561: 23–28.

[4] T. Zhou, S. Chen, J. Wang, Y.Zhang, J.Lia, J.Bai, B. Zhou (2021), *Chem. Eng. J.* 403: 126350.