Área: ELE

Study of carbon matrix gas diffusion electrode for electrogeneration of oxidants species in an electrochemical reactor using membrane

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Palavras *Chave: Hydrogen peroxide , Electrosynthesis, Nanomaterial, Carbon black, Electrochemical degradation*

Highlights

New reactor for eletrogeneration on H_2O_2 and oxidants espécies

The use of membrane increases the values of H_2O_2 electrogenerated

New material based on carbon gas diffusion electrode

Resumo/Abstract

One of the main challenges of environmental studies is the removal of pollutants, among them, are: pesticides, plasticizers, antibiotics, etc., [1,2] In this context, studies addressing alternative forms of degradation have been studied, Advanced Oxidative Processes (AOPs) are one of the highlights, having the hydroxyl radical (OH•) as the principal oxidant species [2,3]. Hydrogen peroxide (H_2O_2) is one of the most used reagents in the advanced oxidated process (AOPs) for being the main precursor of OH•.

This oxidant is formed by the oxygen reduction reaction (ORR), where one of the limitations of this reaction is the solubilization of oxygen in the reaction medium [1]. Thus, gas diffusion electrode (GDE) of carbon matrix appears to overcome this problem due to its triple interface. For this reason, Studies seeking to scale up the electroproduction of hydrogen peroxide in reactors have been growing.

In this work, the gold was to study current density conditions for the electrogeneration of hydrogen peroxide in a flow reactor, using different counter electrodes and evaluate their influence on the reaction. The current density studies were: 25 mA cm^{-2}, 50 mA cm^{-2}, 100 mA cm^{-2}, 150 mA cm^{-2}, and 200 mA cm^{-2}. In an acid medium Na_2SO_4 0,5 M; pH 2.5 adjusted with H_2SO_4 1M using a volume of 1 L, and flow of O_2 50 mL h^{-1}.

Used approach, the first without membrane in a single compartment of solution and the second one with a double compartment dived with a membrane, the studies show that with the membrane it is possible to achieve higher values of H_2O_2 and presents different kinetic and behavior of generation. One of the advanced of use membranes is the possibility of avoiding the consumption of H_2O_2 at the anode.

Calculations of current efficiency and energy consumption were also performed to evaluate the performance of the material and the reactor.

References

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Agradecimentos/Acknowledgments

University of São Paulo, Chemistry Institute of São Carlos University of Castilla - La Mancha, Chemical Engineering Department, FAPESP Process: 2019/08701-4; 2017/10118-0; 2022/07227-0.