Área: ELE

Study of Carbon matrix modified with benzophenone supported on carbon fiber as gas diffusion electrode for electrogeneration of H_2O_2

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Palavras Chave: *hydrogen peroxide electrogeneration, nanomaterial, gas diffusion electrode (GDE), electrocatalysis*.

Highlights

Gas diffusion electrode (GDE) made of carbon matrix modified with organic compound results in higher efficiency for electrogeneration of hydrogen peroxide in alkaline medium

Resumo/Abstract

The hydrogen peroxide (H_2O_2) is one of the most use oxidants in the advanced oxidated process (AOPs). 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 electrodes (GDE) of carbon matrix appear to overcome this problem due to its triple interface. For this reason, studies on modification of the carbon matrix aiming improvements on the electrogeneration of H_2O_2 has growing [2]. In this work, we evaluated the efficiency of H_2O_2 eletrogeneration in alkaline (K_2SO_4, 0,1 M, pH 11) using an GDE of carbon fiber with carbon Printex L6 unmodified (CPL6) and a modified with 2,0% benzophenone-3, 3, 4, 4, -tetracarboxylic dianhydride (CPL6/BTDA 2,0%). Electrolysis were conducted to both GDEs varying the current density (25, 50, 75, 100 mA/cm^2). As result, the GDE CPL6/BTDA 2,0% led to an increase in the H_2O_2 production when compared to the unmodified GDE (Figure 1). Thus, the modification brings advances to the carbon matrix, since resulted in more H_2O_2 electrogenerated applying the same current density. After that, other parameters were studied: the current efficiency (CE) and the energy consumption (EC) at the different current densities tested on the GDE CPL6/BTDA 2,0% (Figure 2). It's clear to note that both 50 mAcm^2 and 75 mAcm^2 presented the same current efficiency, but the energy consumption of the 75mA/cm^2 was a higher than 50mA/cm^2. So, it is possible to conclude that modification of the carbon matrix with the organic compound BTDA was successful and increased the generation of H_2O_2. Moreover, 50 mA/cm^2 was the most suitable current density in the alkaline medium showing a good CE and a low EC.

Figure1- Electrogeneration of H_2O_2 at different current densities

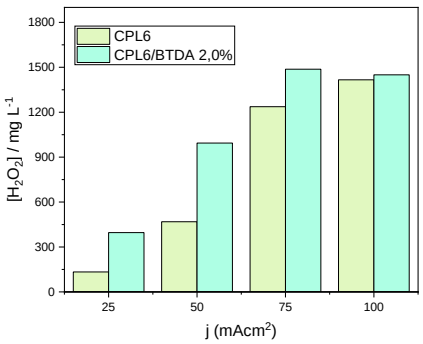
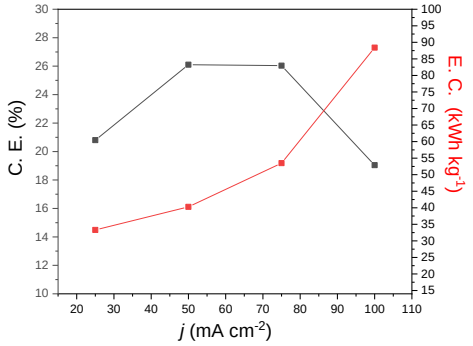


Figure 2- Current efficiency (EC) and energy consumption (EC) as a function of current density for GDE CPL6/BTDA 2,0%



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