

Estudo do efeito do tamanho de partículas de ouro nas reações de redução do oxigênio para a eletrogeração de peróxido de hidrogênio

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Hydrogen peroxide (H_2O_2) is one of the most widely used chemicals globally due to its environmentally friendly oxidant profile. The most common method to produce H_2O_2 , the reduction of anthraquinone, presents several safety and environmental risks. In contrast, electrochemical approaches stand out for offering a safer and greener route for H_2O_2 production[1]. Although catalysts based on noble metals (e.g., Pt, Pd, Au) are thermodynamically favorable for this reaction in acidic media, their high cost makes large-scale application unfeasible. To overcome this limitation, the single-atom catalyst approach is employed, which maximizes catalyst efficiency while reducing the amount of noble metal and maintaining high activity[2]. Therefore, the objective of this work was to synthesize and evaluate gold single-atom catalysts supported on carbon (XE2B) and nitrogen-doped carbon (N-XE2B) matrices for H_2O_2 electrogeneration. The synthesis was performed via a wet impregnation method using a gold(III) precursor on the supports. Results from rotating ring-disk electrode (RRDE) analysis demonstrated that the modified material (Au/XE2B) exhibited higher catalytic activity, reaching disk and ring currents of -2.20 and 1.48 mA cm^{-2} , respectively, superior to those of pure carbon (XE2B) (-1.88 mA and 1.37 mA). Furthermore, a significant catalytic gain was observed, with the reaction onset potential showing a 70 mV positive shift from -0.12 V (XE2B) to -0.05 V (Au/XE2B). The selectivity towards H_2O_2 production also increased, reaching 93% for the modified material at the onset potential, compared to 82% for the pure carbon.

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