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Synthesis of nanostructured Co3O4 by co-precipitation and its application in hydrogen production

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Co3O4 has garnered interest and attention recently due to its extensive application in various technology areas [1,2]. This study aims to synthesize and characterize nanostrucutred Co3O4 using the co-precipitation method and apply them in the hydrogen and oxygen evolution reaction. The nanoparticles were obtained by dissolving a stoichiometrically calculated amount of cobalt acetate, precipitated with ammonia, and subjected to constant stirring in a water bath for 24 hours. Subsequently, the resulting solution was washed five times with deionized water and once with ethanol. The obtained precipitate was then placed in an oven at 100°C for 48 hours. The process was repeated, varying only the percentage of solvents used in the synthesis (water and ethanol). After thermogravimetric analysis, the calcination temperature of the synthesized materials was determined. Characterizations were performed by X-ray diffraction to identify the presence of Co3O4, measurements were conducted to visualize the optical behavior of Co3O4, revealing two absorption bands, one in the visible region and another in the ultraviolet region, which is due to ligand-to-metal electronic transfer. The Co3O4 synthesized using a solvent percentage of 70% water and 30% ethanol was successfully applied to the hydrogen evolution reaction, showing superior performance to other cobalt tetroxides.