Electrochemical Ozone Generation on a Nanocomposite SnO₂ Electrode

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A nanocomposite SnO₂ electrode was prepared and its performance on electrochemical ozone synthesis was studied. The factors affecting ozone production and its current efficiency, such as current density, temperature, pH, supporting electrolyte and liquid flow, were investigated. The formation of hydroxyl radical was detected using trapping protocol and was compared with ozone generation. The results indicate that the ozone production increases with current density, and an optimum current density of 5 mA cm⁻² is obtained for the current efficiency of ozone generation. Lower temperature, lower pH and higher liquid flow favor ozone production as well as its current efficiency. As a supporting electrolyte, Na₂SO₄ appears to be more suitable than NaClO₄, NaNO₃ and NaCl for ozone generation on the nanocomposite SnO₂ electrode. An optimum electrolyte concentration of Na₂SO₄ is observed to be 0.25 M, and a little bit of KPF₆ addition (0.01 - 0.05 M) has an obviously positive effect on ozone generation. Current density and solution pH have a coincident effect on ozone and hydroxyl radical generation, while temperature has an inconsistent effect on ozone and hydroxyl radical generation and KPF₆ addition has no effect on hydroxyl radical generation on the nanocomposite SnO₂ electrode. The morphology and structure of the nanocomposite SnO₂ electrode before and after accelerated life test were characterized by SEM and XRD analysis. It is suggested that the deactivation of nanocomposite SnO₂ electrode is caused by the destruction of SnO₂ coating film and the growth of TiO₂ between Ti-base and SnO₂ coating film.

Keywords: Ozone; hydroxyl radical; SnO₂ electrode; deactivation

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