Electrochemical Degradation of Bisphenol A Using Different Modified Anodes Based on Titanium in Aqueous Solution

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Electrochemical degradation of bisphenol A (BPA) was researched by using Ti/SnO₂-SbO₂/PbO₂, Ti/Ti₄O₇, Ti/RuO₂ and Ti/RuO₂-IrO₂ anodes in aqueous solution. The electrochemical degradation conditions were acquired by investigating the effect of different working factors, such as current densities (5-40 mA/cm²), initial pH (3.4-12.0) and different plate distance (0.5-3 cm). The best performance of BPA degradation and COD removal was obtained with anodes of Ti/Ti₄O₇ and Ti/SnO₂-SbO₂/PbO₂, the Ti/RuO₂-IrO₂ anode exhibited a moderate capability to degrade BPA, and Ti/RuO₂ showed the lowest efficiency in BPA degradation. Samples were separated by high performance liquid chromatography (HPLC), and the intermediates products were identified with mass spectrometry (MS). The pathways and mechanisms of the electrochemical degradation of BPA process were researched and it could be divided into the following three steps. First, the BPA was believed to be attacked by •OH radical generated from water electrolysis and then decomposed into one-ring aromatic compounds. Subsequently, these one-ring aromatic compounds could be oxidized and converted to short chain aliphatic acids. Finally, all the intermediate compounds were mineralized into CO₂ and H₂O. The Ti/Ti₄O₇ anode had the highest oxygen evolution potential of 2.4 V, for the Ti/SnO₂-SbO₂/PbO₂ anode it was 1.6 V, the Ti/RuO₂ and Ti/RuO₂-IrO₂ anodes had similar oxygen evolution potentials of 1.1 V and 1.2 V, respectively. By comparing the different electrodes, the Ti/Ti₄O₇ anode have high oxygen evolution potential and a good performance of organic degradation, it is strong potential material for effective electrochemical degradation of BPA and other similar structure of organic pollutants in wastewater.

Keywords: Bisphenol A (BPA); Electrochemical degradation; Ti/Ti₄O₇; Hydroxyl radical; Mechanism;

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