Enhanced performance of a PbO₂ electrocatalytic anode and its application for phenol oxidation

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To enhance the electrocatalytic performance and stability of PbO₂ electrodes for the degradation of aqueous refractory organic pollutants, a sodium lauryl sulfonate (SLS)-modified PbO₂ electrode was prepared by a surfactant-assisted anodic electrodeposition method. The morphology, crystal phase, and electrocatalytic performance were studied by scanning electron microscopy (SEM), X-ray diffraction (XRD), linear sweep voltammetry (LSV) and phenol degradation. The stability and hydrophobicity of the PbO₂ anodes were investigated by accelerated life tests and contact angle measurements. The optimal SLS concentration is 120 mg/L in a bath solution during the electrode preparation process. The PbO₂-SLS-120 anode has an accelerated anode life of 72 h, which is 2.5 times longer than that of the undoped PbO₂ anode. The contact angle and oxygen evolution potential (OEP) of the PbO₂-SLS-120 anode are 102° and 1.54 V, respectively, which are larger than those of undoped PbO₂ anodes. It is suggested that PbO₂-SLS anode has good electrocatalytic performance due to the improvement of the electrode surface structure. Therefore, a PbO₂ anode with a simple and feasible preparation method was obtained with a good application prospect for the treatment of wastewater.

Keywords: electrocatalytic anode; lead dioxide; sodium lauryl sulfonate; hydrophobicity; phenol.

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