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Aqueous tetracycline degradation by coal-based carbon electrocatalytic filtration membrane: effect of nano antimony-doped tin dioxide coating

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Abstract

In this work, a novel electrocatalytic filtration membrane with high degradation efficiency and low cost was fabricated by coating nano antimony-doped tin dioxide (Sb-SnO₂) on a porous coal-based carbon membrane (CM) through sol-gel method. The nano Sb-SnO₂ is homogeneously distributed on the CM surface and is firmly attached to the CM via C-O-Sn chemical bond. Due to the positive effect of nano Sb-SnO₂ coating, the Sb-SnO₂/CM possesses excellent electrocatalytic activity and shows a much better tetracycline (TC) degradation performance than CM. The TC removal rate of Sb-SnO₂/CM could be achieved 96.5% after 6 h operation while that of CM was only 72.8%. Degradation pathway of TC was also explored using HPLC-MS. Furthermore, the effective TC degradation is attributed to the synergistic effects of direct and indirect electrochemical oxidation. During the indirect oxidation process, •OH radicals rather than •O₂⁻ play the dominant role.

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