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Applying Mn-Sb/SnO2 anode-based electrochemical induced iodide recycle for continuous and efficient ozone resource utilization in VOCs removal

摘要

开发高效、连续的臭氧资源利用技术对于实现环境可持续发展至关重要。本研究利用 Mn-Sb/SnO2 阳极构建了一个碘化物电循环系统，该系统既能高效去除臭氧，又能利用臭氧降解挥发性有机化合物（VOC），两者的去除率均达到 100%。在该系统中，臭氧和 I- 之间的自发氧化还原反应促进了 IO3- 的生成，同时确保了臭氧的完全去除。在随后的 IO3- 氧化反应（IO3OR）中，Mn-Sb/SnO2 电极表现出卓越的 IO3OR 性能，法拉第效率高达 96.2%。随后，IO3OR 反应中生成的 IO4- 被进一步活化，生成 IO3·和·OH 自由基，从而有效地矿化了各种挥发性有机化合物，矿化率高达 76%。此外，系统中的碘化物可以循环使用，从而确保系统能够持续稳定地运行。这种创新方法为高效、可持续地利用臭氧资源提供了一种前景广阔的解决方案。

关键词

Mn-Sb-SnO2 、臭氧、挥发性有机化合物、IO3·and ·OH 、碘化物

Abstract

The development of efficient and continuous ozone resource utilization technology is crucial for achieving environmentally sustainable development. In this study, an iodide electro-cycling system using the Mn-Sb/SnO2 anode was constructed, achieving both efficient ozone removal and its utilization for the degradation of volatile organic compounds (VOCs), with the removal of both reaching 100%. Within this system, the spontaneous redox reaction between ozone and I- facilitated the generation of IO3- while ensuring complete ozone removal. For the subsequent IO3- oxidation reaction (IO3OR), the Mn-Sb/SnO2 electrode exhibited exceptional performance of IO3OR, with a Faraday efficiency of 96.2%. Afterward, the IO4- generated during the IO3OR is further activated to generate IO3·and ·OH free radicals, enabling the effective mineralization of various VOCs with a mineralization rate reaching up to 76%. Moreover, the iodide in the system can be recycled, which ensures the system can operate continuously and stably. This innovative approach offers a promising solution for the efficient and sustainable resource utilization of ozone.

Keywords

Mn-Sb-SnO2, Ozone, VOCs, IO3·and ·OH, Iodide

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