Efficient treatment of aniline containing wastewater in bipolar membrane microbial electrolysis cell-Fenton system

Aniline-containing wastewater can cause significant environmental problems and threaten humans's life. However, rapid degradation of aniline with cost-efficient methods remains a challenge. In this work, a novel microbial electrolysis cell with bipolar membrane was integrated with Fenton reaction (MEC-Fenton) for efficient treatment of real wastewater containing a high concentration (4460 ± 52 mg L$^{-1}$) of aniline. In this system, H$_2$O$_2$ was in situ electro-synthesized from O$_2$ reduction on the graphite cathode and was simultaneously used as source of radical dotOH for the oxidation of aniline wastewater under an acidic condition maintained by the bipolar membrane. The aniline was effectively degraded following first-order kinetics at a rate constant of 0.0166 h$^{-1}$ under an applied voltage of 0.5 V. Meanwhile, a total organic carbon (TOC) removal efficiency of 93.1 ± 1.2% was obtained, revealing efficient mineralization of aniline. The applicability of bipolar membrane MEC-Fenton system was successfully demonstrated with actual aniline wastewater. Moreover, energy balance showed that the system could be a promising technology for removal of biorefractory organic pollutants from wastewaters.

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