Alternate switching between MFC and MEC for H2O2 synthesis and residual removal in Bioelectro-Fenton system

Sustainable H2O2 supply and elimination of residual H2O2 are two key challenges to the Fenton processes treating recalcitrant contaminants. In this study, an innovative Bioelectro-Fenton system capable of alternate switching between microbial electrolysis cell (MEC) and microbial fuel cell (MFC) mode of operation was developed to meet the challenges. In the MEC mode, H2O2 was electrochemically produced which reacts with Fenton’s reagent (Fe II) to form hydroxyl radical. The residual H2O2 (unused H2O2) is removed as electron acceptor by switching the system to MFC mode. Complete decolorization and mineralization of 50 mg L\(^{-1}\) methylene blue (MB) was achieved in the MEC mode with apparent first order rate constants of 0.43 and 0.22 h\(^{-1}\), respectively. After switching to the MFC mode, residual H2O2 of 180 mg L\(^{-1}\) was removed at a removal rate of 4.61 mg L\(^{-1}\) h\(^{-1}\) while generating a maximum current density of 0.49 A m\(^{-2}\). The MB degradation and residual H2O2 removal were affected by external resistance, cathode pH and initial MB concentration. Furthermore, the system performance was enhanced under stack operation. This study provides a proof-in-concept new system for efficient and cost-effective H2O2 control and recalcitrant pollutants removal.

General information
Publication status: Published
Organisations: Department of Environmental Engineering, Residual Resource Engineering
Contributors: Zhang, Y., Angelidaki, I.
Pages: 91-91
Publication date: 2016

Host publication information
Title of host publication: Book of abstracts: The 3rd European meeting of the International Society for Microbial Electrochemistry and Technology (EU-ISMET 2016)
Place of publication: Rome, Italy
Editors: Aulenta, F., Majone, M.
Electronic versions:
Book_of_Abstracts_PDF.pdf
Research output: Chapter in Book/Report/Conference proceeding › Conference abstract in proceedings – Annual report year: 2016 › Research › peer-review