

Recent trends and advances in microbial electrochemical sensing technologies: An overview

Current Opinion in Electrochemistry 30, 100762

December 1, 2021

Written by

Microbial electrochemical systems utilize the electrochemical interaction between microorganisms and electrode surfaces to convert chemical energy into electrical energy, offering a promise as technologies for wastewater treatment, bioremediation, and biofuel production. Recently, growing research attention has been devoted to the development of microbial electrochemical sensors as biosensing platforms. Microbial electrochemical sensors are a type of microbial electrochemical technology (MET) capable of sensing through the anodic or the cathodic electroactive microorganisms and/or biofilms. Herein, we review and summarize the recent advances in the design of microbial electrochemical sensing approaches with a specific overview and discussion of anodic and cathodic microbial electrochemical sensor devices, highlighting both the advantages and disadvantages. Particular emphasis is given on the current trends and strategies in the design of low-cost, convenient, efficient, and high performing METs with different biosensing applications, including toxicity monitoring, pathogen detection, corrosion monitoring, as well as measurements of biological oxygen demand, chemical oxygen demand, and dissolved oxygen. The conclusion provides perspectives and an outlook to understand the shortcomings in the design, development status, and sensing applications of microbial electrochemical platforms. Namely, we discuss key challenges that limit the practical implementation of METs for sensing purposes and deliberate potential solutions, necessary developments, and improvements in the field.