Title:	Bio-anode assisted removal of mercury at the cathode of microbial fuel cells
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Abstract:	Due to the rapid increase in industrialization and modern life standards, water bodies are getting polluted with several pollutants such as pharmaceutical waste, heavy metals, pathogens leading to toxic effects on the ecosystem and human health. Among these pollutants, heavy metals are considered to be the most hazardous due to their density greater than 4000 kg/m3 . These heavy metals are emitted from various anthropogenic and natural activities and invade the food chains of various life forms including humans. Mercury is one of the major concerns among all the heavy metals due to its high toxicity at lower concentrations and unique bioaccumulation and biomagnification behavior. There are several methods for the removal of heavy metals from the water bodies, but most are not cost-effective and environmentally friendly. The use of Bio-electrochemical systems is an emerging approach for the removal of different types of pollutants including heavy metals. In this study, bio-anode assisted removal of Hg(II) ions at the cathode of microbial fuel cells (MFCs) was tested. An electroactive biofilm (EAB) was developed at the anode of MFCs using chronoamperometry technique at an applied potential of 200 mV. Bioeletcroctalytic current generation and scanning electron microscopy (SEM) imaging of the bioanode confirmed the EAB formation. The maximum power density of 32.5 mW/m2 and 35 mW/m2 was obtained with oxygen and Hg(II) electron acceptors, respectively thereby suggesting mercury as the efficient reductant at the cathode of MFCs. In bioanode-assisted mercury removal tests, 98% removal in Hg(II) ions at the cathode was achieved within 24 h. This study thus validates the application of the low-cost bioelectrochemcial approach for the removal of mercury from contaminated environments such as groundwater and freshwater reservoirs.
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