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Opinion

Sediment Microbial Fuel Cells: Opinion on Various Factors Impeding the Deployment

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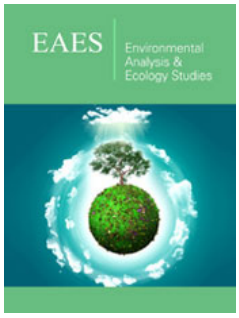

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Sediment Microbial Fuel Cells

Microbes and other living organisms use redox reactions as a source of energy for their development and metabolism. Ever since the exploration of this phenomenon, there has been a great deal of interest in exploiting it for production purposes. One technology that has demonstrated potential in using of using such a phenomenon is the Sediment Microbial Fuel Cells (SMFCs), a subtype of Microbial Fuel Cells (MFCs) that make use of the organically existing redox gradients in ecologically rich sediments and generate bioelectricity [1]. SMFCs offer a myriad of functional benefits over conventional energy sources such as encompassing rapid transformation of organic matter into energy, functioning in a range of different environments, along with low operating temperatures, cost-effectiveness, minimal periodic maintenance requirement (such as frequent temporary fix), simple architecture, access to a variety of affordable fuel sources, ability to be installed in distant regions, and neither any production of harmful components [2]. The schematic of SMFC is illustrated in Figure 1. The broad usage for sediment microbial fuel cells can be often seen in supplying sustainable energy supplies for long a period surveillance equipment placed in the ocean, riverbank, reservoir, irrigation, gulf, and other bodies of water; and elimination of organic materials in sediments [3].

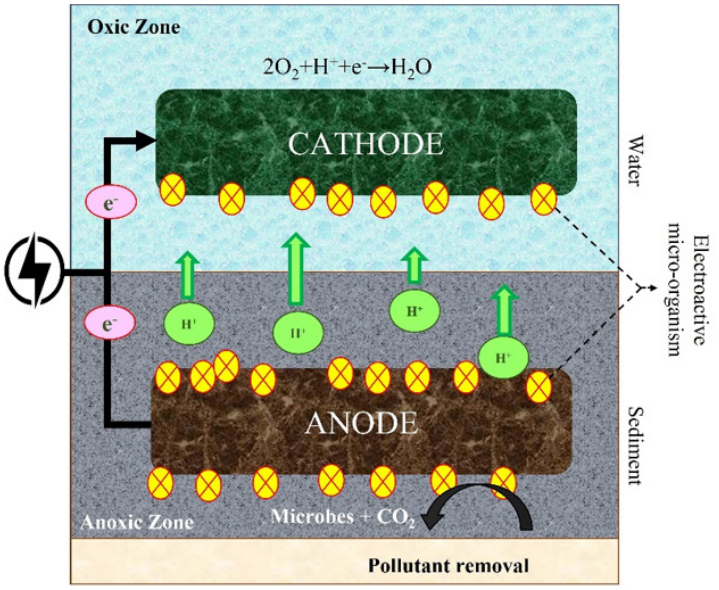

Figure 1

Opinion Regarding the Challenges with SMFC Deployment

Even though SMFCs have been widely investigated for their ability to capture energy extracted from natural sediment, research into their usage in practical usage for the aforementioned applications has only just begun. Though the SMFC system has immense potential for usage, several features and difficulties must be overcome, particularly in sized businesses of such applications before it can become a reality. This is in particular related to the accessible scientific literature. So far, most studies on SMFCs have focused on overall power density, with just a few highlighting the energy metrics that could be procured. Furthermore, the relationship between organic compound deterioration and the power generation processes remains to generate ideal results. Since SMFCs' typical coulombic efficiency for treating wastewater is quite poor, the power production process has minimal effect on removing contaminants. Despite research on the functionality of various electrode materials, only minor improvements in energy generation and pollution control have been obtained. Potential developments of SMFC include the biological treatment of sediments, as well as the placement of sensors in remote areas, in addition to the degradation of pollutants in wastewater. In addition to bioremediating petroleum hydrocarbons in deposits, SMFC may also be utilized to bioremediate sludge cellulosic and organic compounds.

The SMFC is a splendid solution for deploying low-power wireless devices viz. oceanographic motion sensors and surveillance systems however the articles reported on existing energy outcomes by the SMFC system are indeed inconsequential. In addition to these, the SMFC technology needs storage, also known as an energy management system, since it is pretty hard to continually generate energy. The energy control system comprises a capacitor, a frequency regulator, and a DC-DC converter, which allows the generated electricity to be exploited to energize the remote sensor eternally. Besides the significance of gaining insights into the application-oriented challenges, the general technical limitations on the microorganisms inhabiting sediments and the overlying water play a pivotal role and requires more comprehensive research. Another technical limitation is the dearth of research on the intensive effects of the environment on microbes. The electrode preparation techniques, cost of the electrode, and ineffective electrode kinetics are not much reported in contrast over other fuel cell types. addressing which will benefit cooperation for the commercialization that could meet the Sustainable Development Goal 7 (SDG-7) ensures access to affordable, reliable, sustainable and modern energy for all.

References

1. Zabihallahpoor A, Rahimnejad M, Talebnia F (2015) Sediment microbial fuel cells as a new source of renewable and sustainable energy: Present status and future prospects. RSC Adv 5: 94171-94183.
2. J Thomas YR, Picot M, Carer A, Berder O, Sentieys O, et al. (2013) A single sediment-microbial fuel cell powering a wireless telecommunication system. Journal of Power Sources 241: 703-708.
3. Ewing T, Ha PT, Babauta JT, Tang HT, Heo D, et al. (2014) Scale-up of sediment microbial fuel cells. Journal of Power Sources. 272: 311-319.