

Study of Bagmati River Pollution Level and Remediation of Heavy Metal using Microbial Fuel Cell

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Abstract : This study was used to assess the potential of MFCs in removing heavy metals from the urban Bagmati River while (2) simultaneously producing electricity. Upon physicochemical and biological analysis of the collected water samples from three different locations during summer and winter, it was found that the Chemical Oxygen Demand (COD) and Total Suspended Solid (TSS) values exceeded the Ministry of Environment's (MOE 2010) guidelines, and the river was contaminated with lead (Pb). The meta-genomic analysis, revealed the presence of four electrogenic bacterial genera: Pseudomonas, Rhodobacter, Rhodospirillum rubrum, and Shewanella. Upon attainment of optimal configuration - COD 3500mg/L, a Graphite rod anode (TSA-13.31cm²), Platinum cathode (10×10×0.5mm) as electrodes, and a 1% bacterial consortium- MFCs with inoculum enriched Bagmati water, showed a maximum voltage of 0.08 ± 0.001 V, a current density of 0.8 ± 0.01 A/m², and a power density of 0.070 ± 0.002 W/m². Comparatively higher metal removal was also achieved in this operation, with approximately 100% As (III), 99% Pb (II), 98% Hg (II), and at least 25% Cr (VI) removal. Our results highlight MFC to be able to remediate heavy metals and also generating electricity. The research showed that though the pollution in Bagmati River had decreased in terms of parametric concentrations as researched in Baniya et al, 2019, it is still polluted exceeding guideline values, possibly indicating distortion of natural restoration capacity of river. Additionally, it also showed that with downstream flow of river, it indeed becomes less polluted but human activities isn't letting this natural process to revive.

Keywords : bagmati, heavy metal contamination, heavy metal remediation, bio-electricity

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