Potentials of Inexpensive Microbial Fuel Cell In-situ Application in Groundwater Quality Monitoring in Urban Settlement - Tanzania : *Field Experience*

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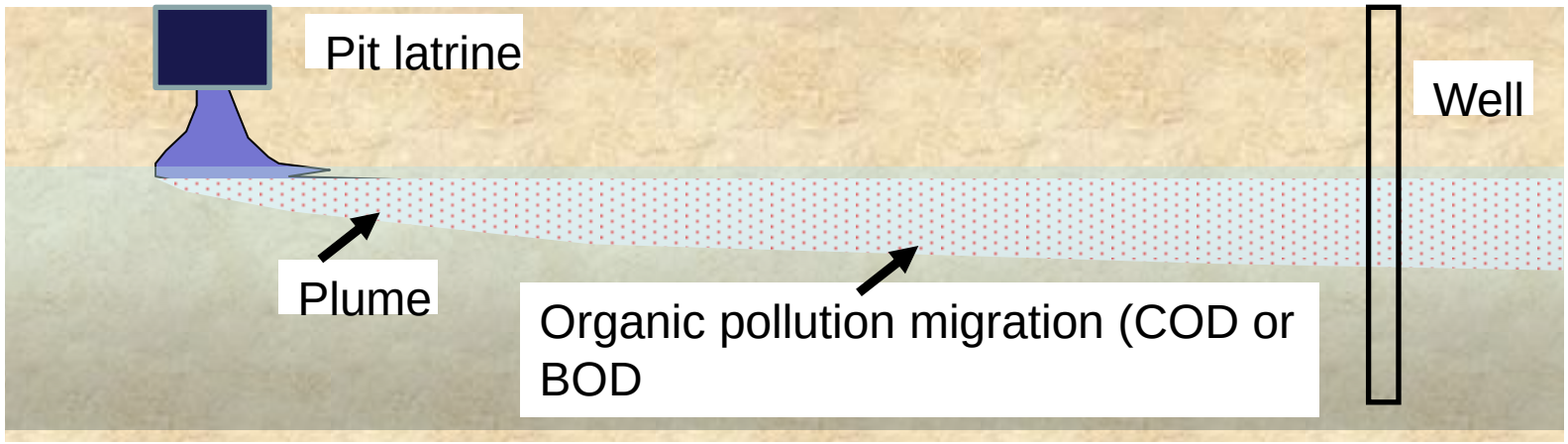
Definition: Microbial Fuel Cell (MFC)

MFC –Is a bio-electrochemical device that produces electrical energy through the action of specific microbes known as anodophiles. Since the production of electricity can be altered by either the microbial consumption of substrate or the inhibition of metabolic pathways by toxic compounds, MFCs can be applied as microbial biosensor for *in-situ* analysis and monitoring target chemicals

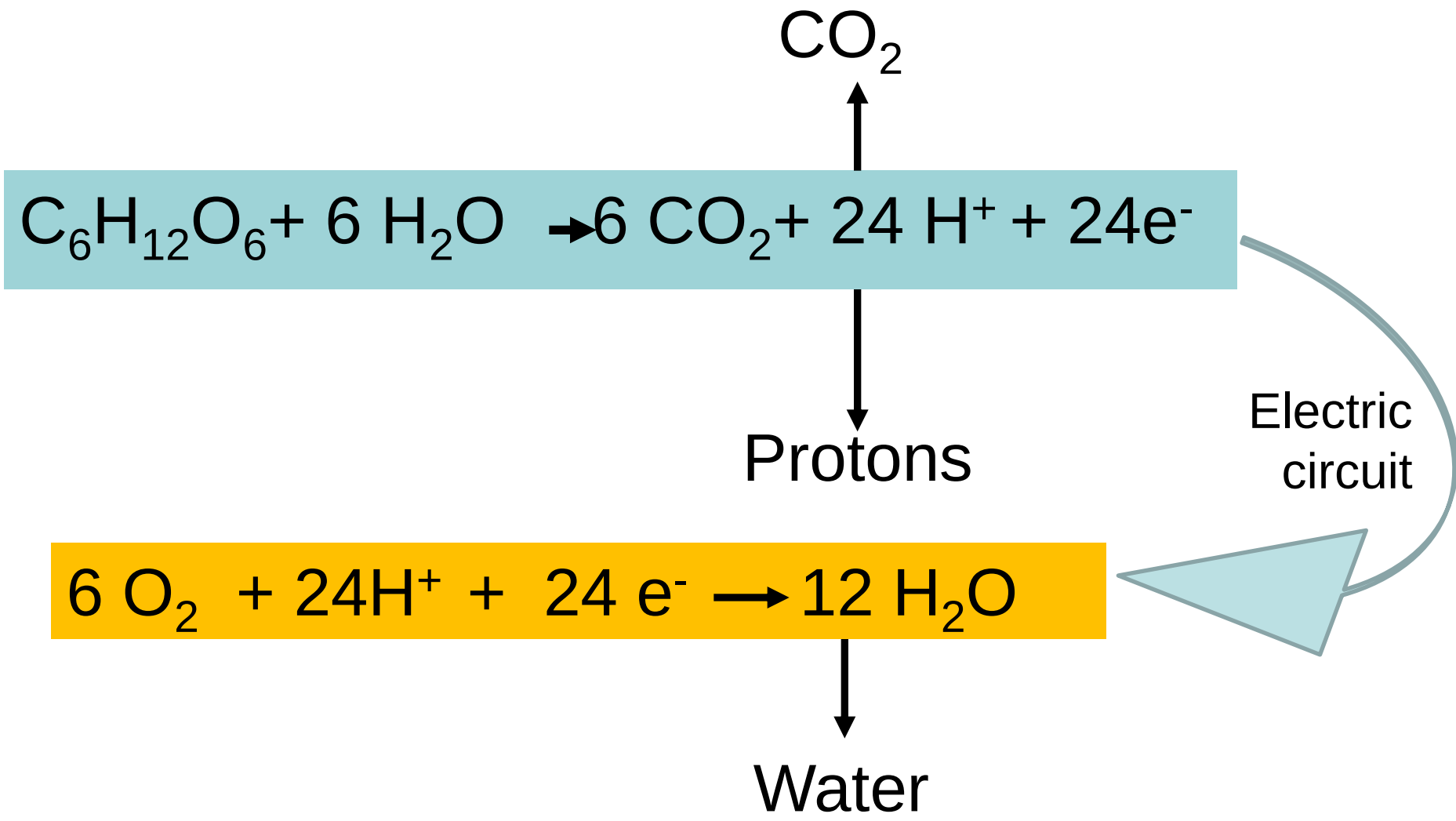
(Sharon Velasquez-Orta, 2016).

Definition: Microbial Fuel Cell (MFC) *(Continues)*

- MFC produces electric current proportional to quantity of biomass present in the pollutant
- The amount of electric current produced is directly proportional to organic load contained in a sample measured in concentrations of COD or BOD



WORKING PRINCIPLE OF MFC



Mediators or direct contact

Electrons → **Electrode *(Anode)***

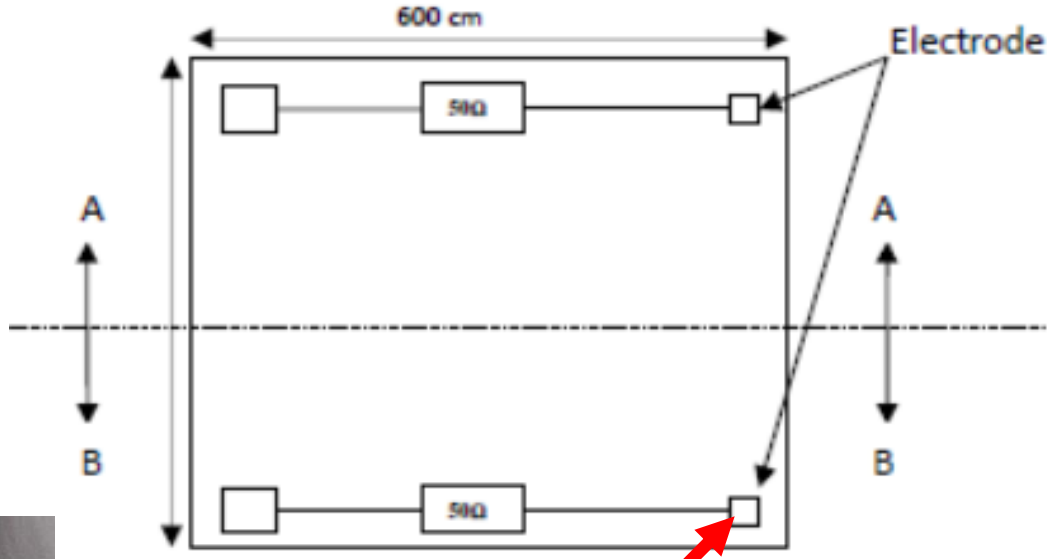
↓

Electrical Circuit 

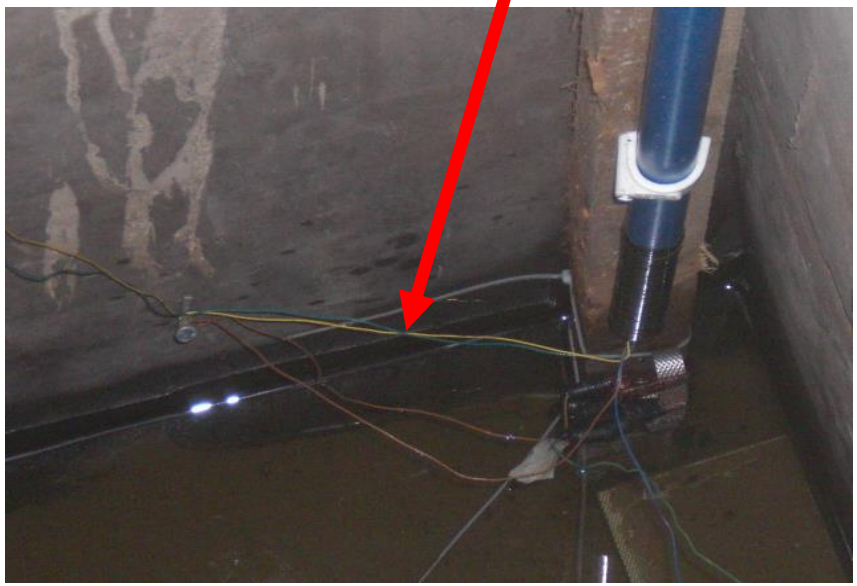
↓

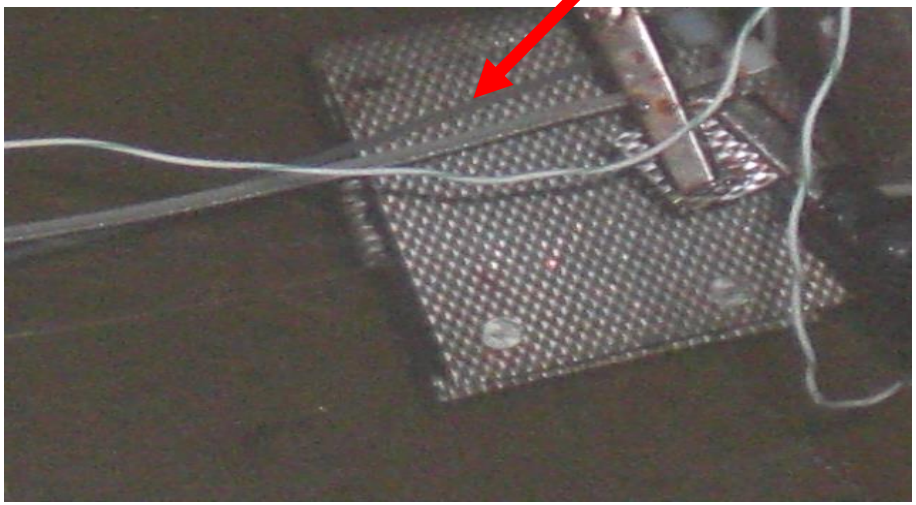
← **Electrons** ← **Electrode*(Cathode)***

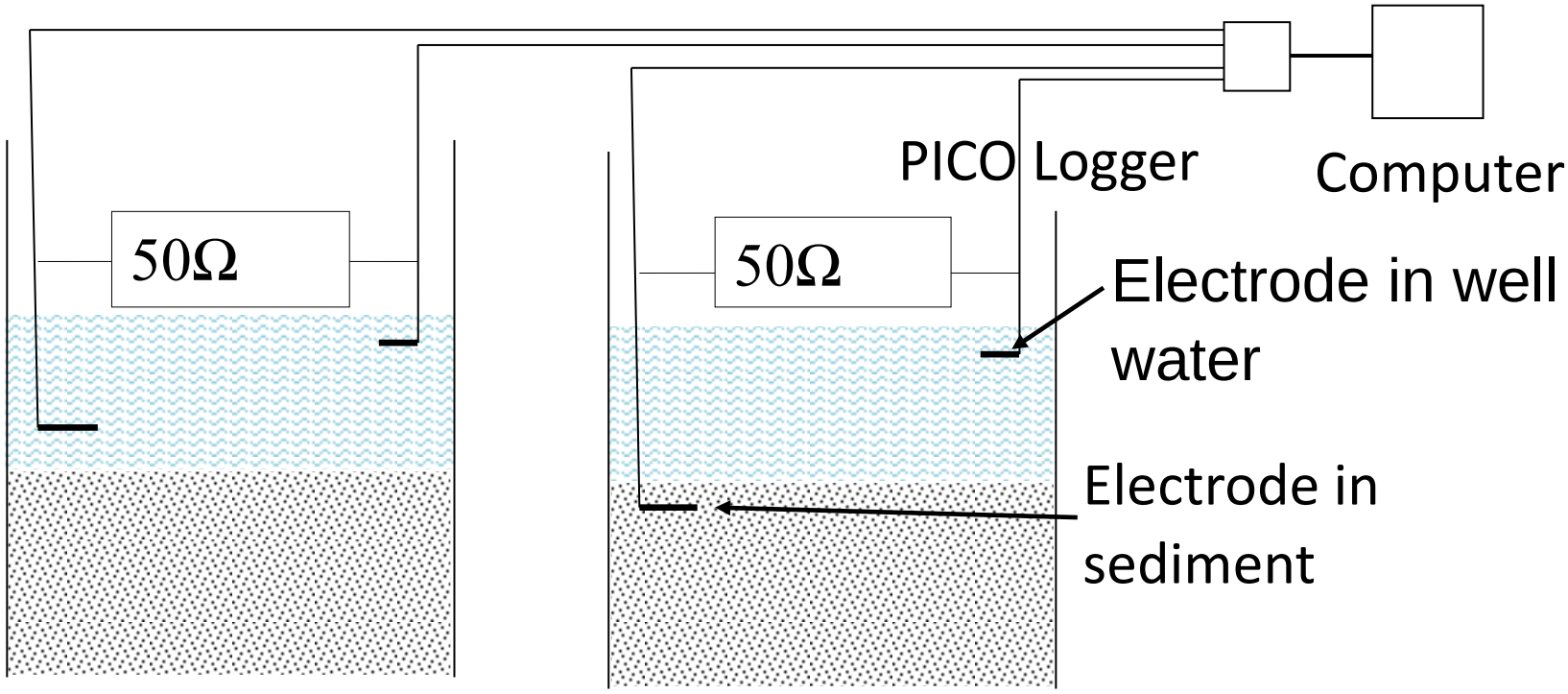
Electrodes wiring in a shallow well leading to a real time monitoring facility- Picologger and computer



Shallow Well + Wiring



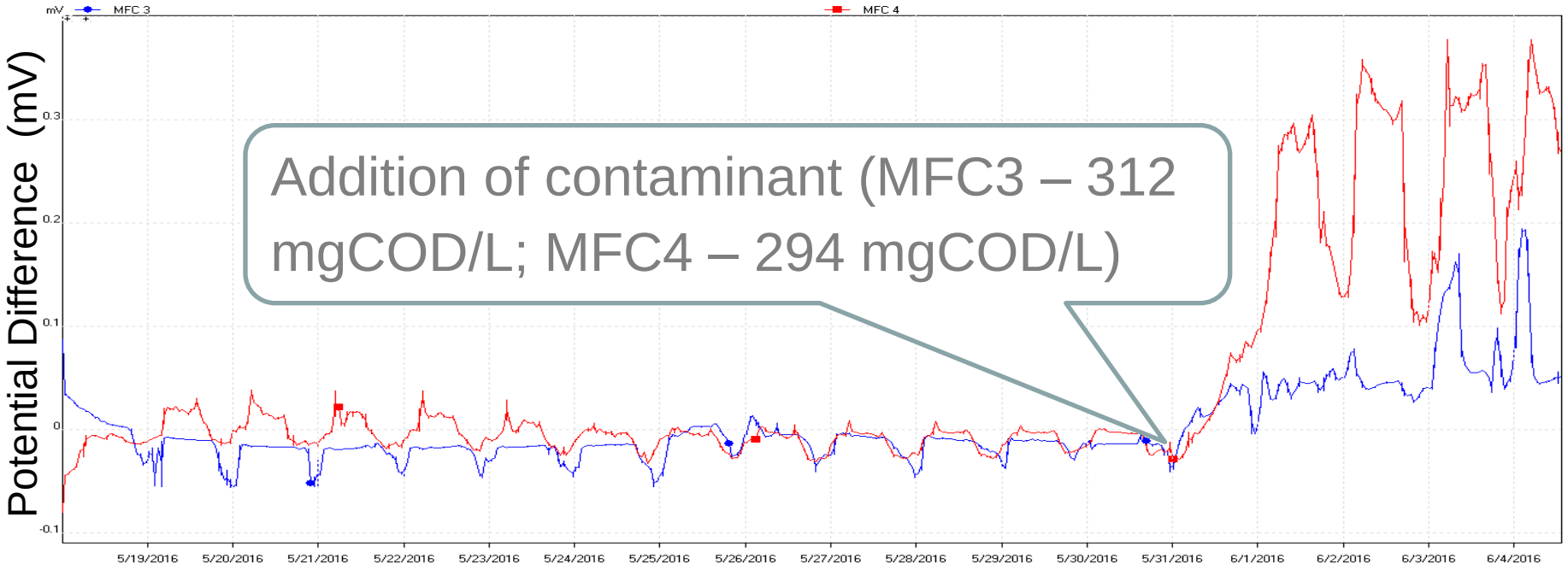




Section A -A: MFC2

Section B-B: MFC1

Electrode material:	**Stainless steel mesh**
Electrode Sizes:	Anode size – 10 cm x 10 cm Cathode size - 2 cm x 2 cm



Time (Days)

Potential Difference (mV) of the electrolyte increases after addition of contaminant – MFC3 & MF4 (Control Experiments)

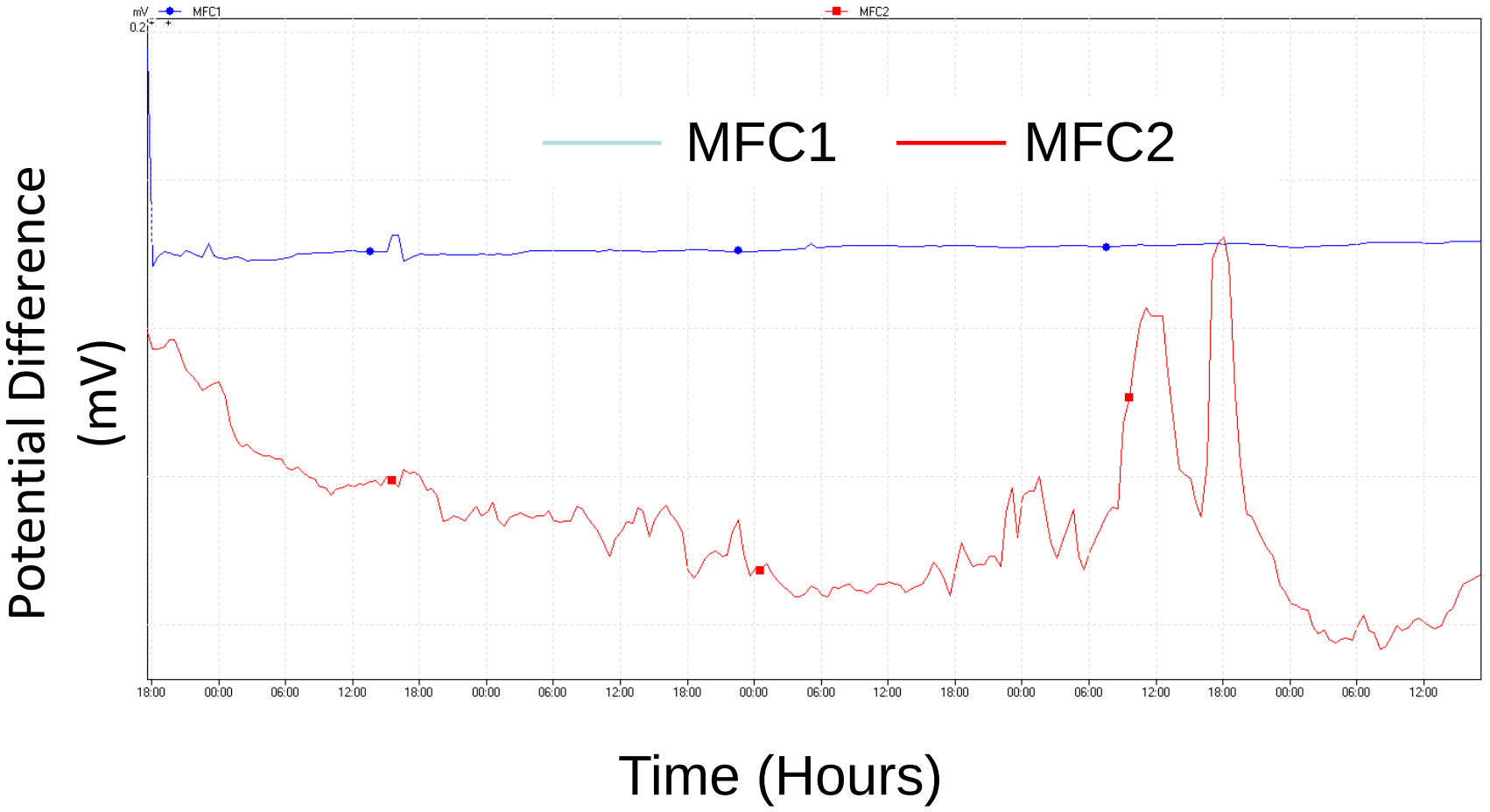


Figure 2: Performance of a Microbial Fuel Cell Biosensors installed in a household shallow well

Conclusion: *These* results show promising in-situ real time ground water monitoring needed for real time protection of public health particularly in urban settlements susceptible to groundwater pollution due to on-site pollution sources. However more field studies are needed to calibrate the performance of the biosensor together with provision of alarm to signal exceedance of predetermined contaminant levels

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