

Enhanced detection of toxicity in wastewater using 2D smooth plane anode based microbial fuel cell toxicity sensor

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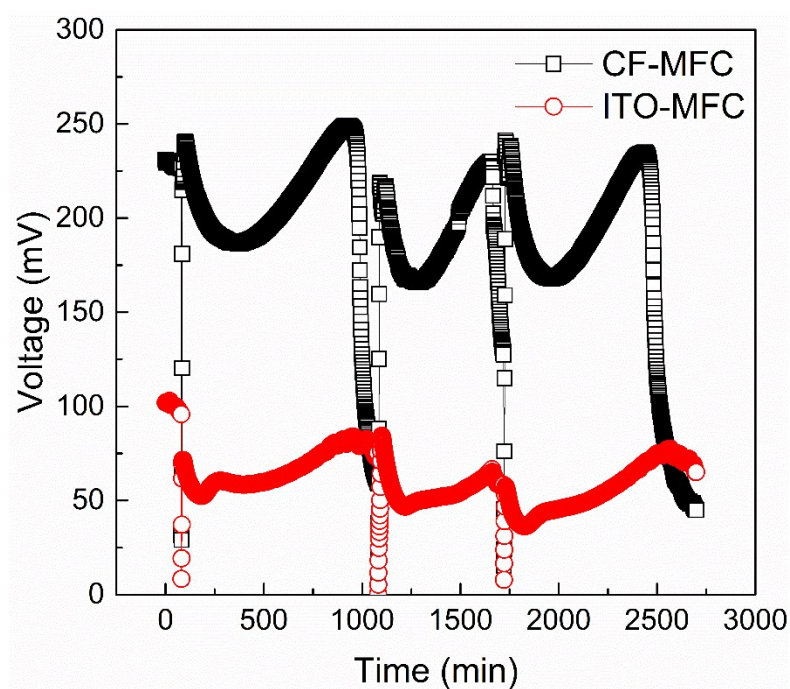
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Table S1. The concentration of the free lead ions in MFCs

Detection of free ions of lead by ICP-OES	
Theoretical concentration	Actual concentration
1.0 mg/L	0.989 ± 0.011 mg/L
2.0 mg/L	1.916 ± 0.027 mg/L

Table S2. The pH change of wastewater after introduction of lead nitrate standard solution

	30 min	60 min	120 min
Wastewater	9.18 ± 0.03	9.18 ± 0.03	9.18 ± 0.02
Wastewater+ 1.0 mg/L Pb ²⁺	9.15 ± 0.02	9.15 ± 0.02	9.15 ± 0.04
Wastewater+ 2.0 mg/L Pb ²⁺	9.13 ± 0.04	9.13 ± 0.05	9.12 ± 0.05

**Fig. S1.** The voltage output of three consecutive cycles of the MFC sensors.

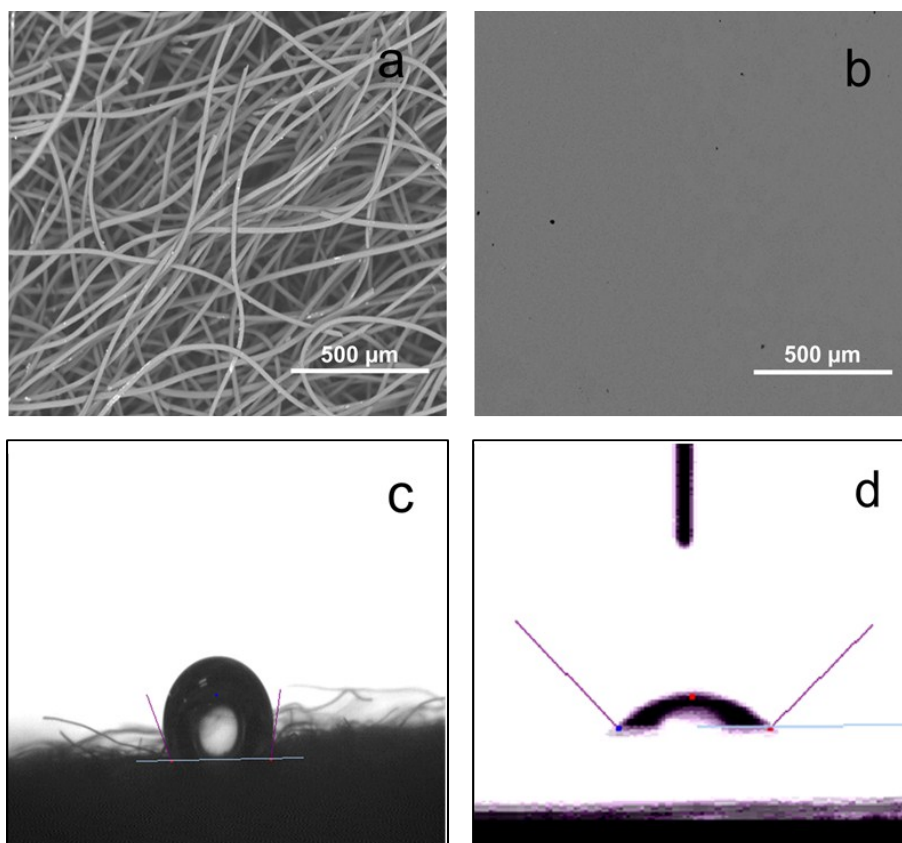


Fig. S2. SEM image of pristine anodes: (a) carbon felt and (b) ITO film. Water contact angles of pristine anodes: (c) carbon felt and (d) ITO film.

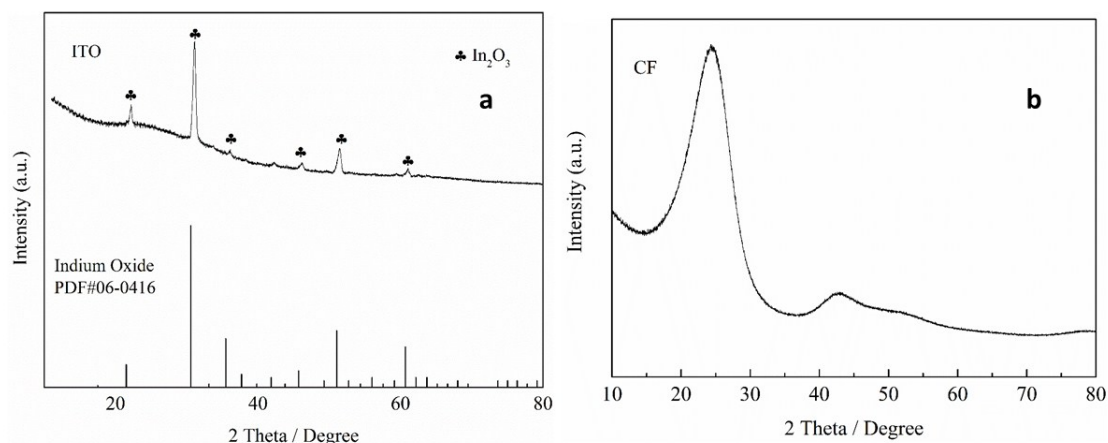


Fig.S3. XRD patterns of (a) ITO anode and (b) CF anode

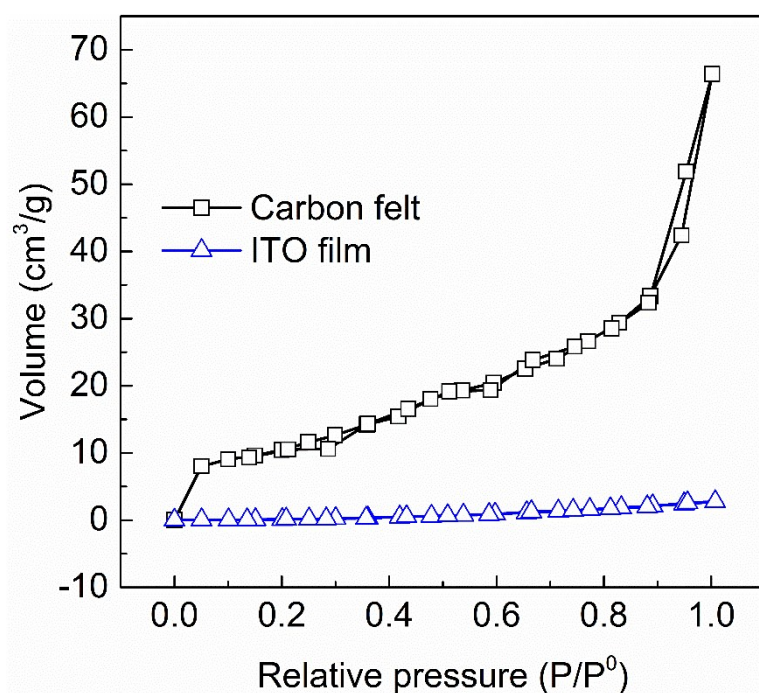


Fig. S4. N₂ adsorption – desorption isotherm plot of carbon felt and ITO film.

N₂ adsorption/desorption isotherms at 77 K were measured on BET relative surface area analyzer. Samples were filled in a tube and allowed to dry for 4 h at 100 °C prior to the measurements. After the test, 4~5 data points were selected to make the diagram and then the slope and intercept were calculated. The relative surface area was then calculated based on the BET equation.¹

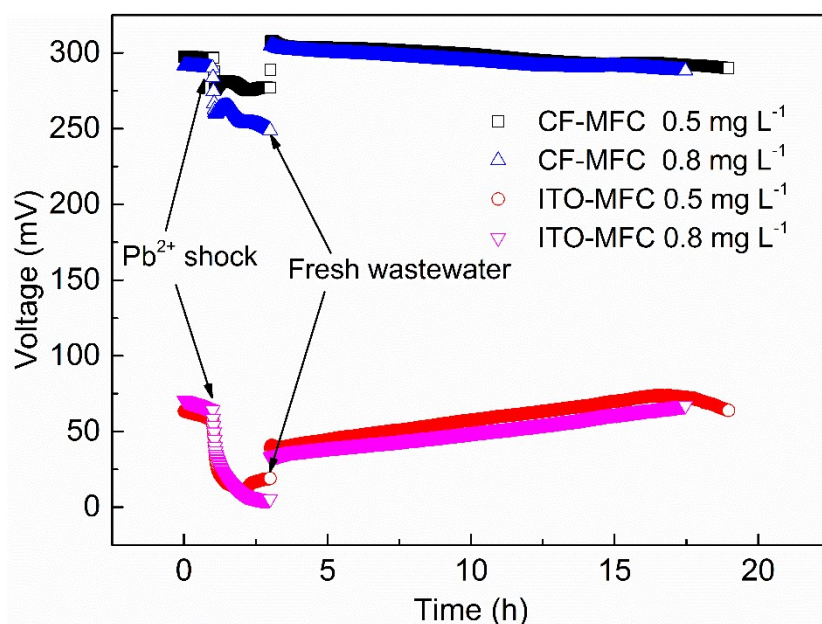


Fig. S5 Voltage recovery of MFC sensors with fresh wastewater and 300 mg L⁻¹ sodium acetate after 0.5mg L⁻¹ and 0.8 mg L⁻¹ Pb²⁺ shocks

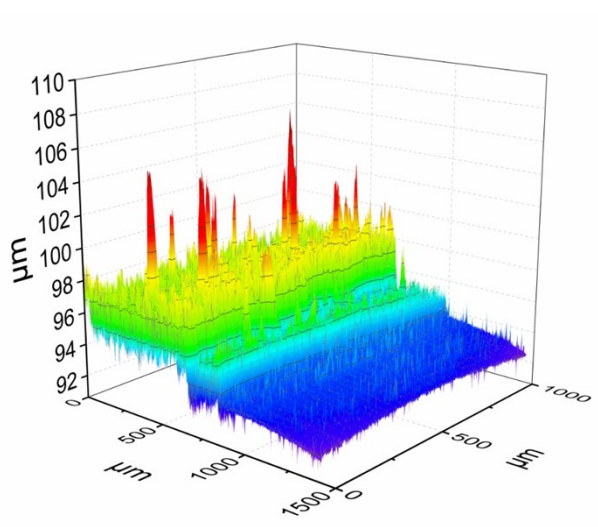


Fig. S6. Confocal laser scanning microscopy image of anodic biofilm cultivated on ITO film surface (part of the biofilm was scratched using a clean scalpel to show the biofilm thickness). The biofilm was cultivated for a month using half municipal wastewater and half PBS solution.

Reference

- 1 S. Brunauer, P.H. Emmett, E. Teller, Adsorption of Gases in Multimolecular Layers, J. Am. Chem. Soc. 60 (1938) 309-319.