SUPPORTING INFORMATION

Impact of cleaning procedures on restoring cathode performance for microbial fuel cells treating domestic wastewater

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In an MFC the electrons generated by the oxidation of acetate on the anode are transferred through an external circuit to the cathode where they are used to reduce the oxygen. Negative ions are consequently transported from the cathode to the anode and positive ions diffuses back to the cathode to ensure the electroneutrality of the solution (Figure S1).

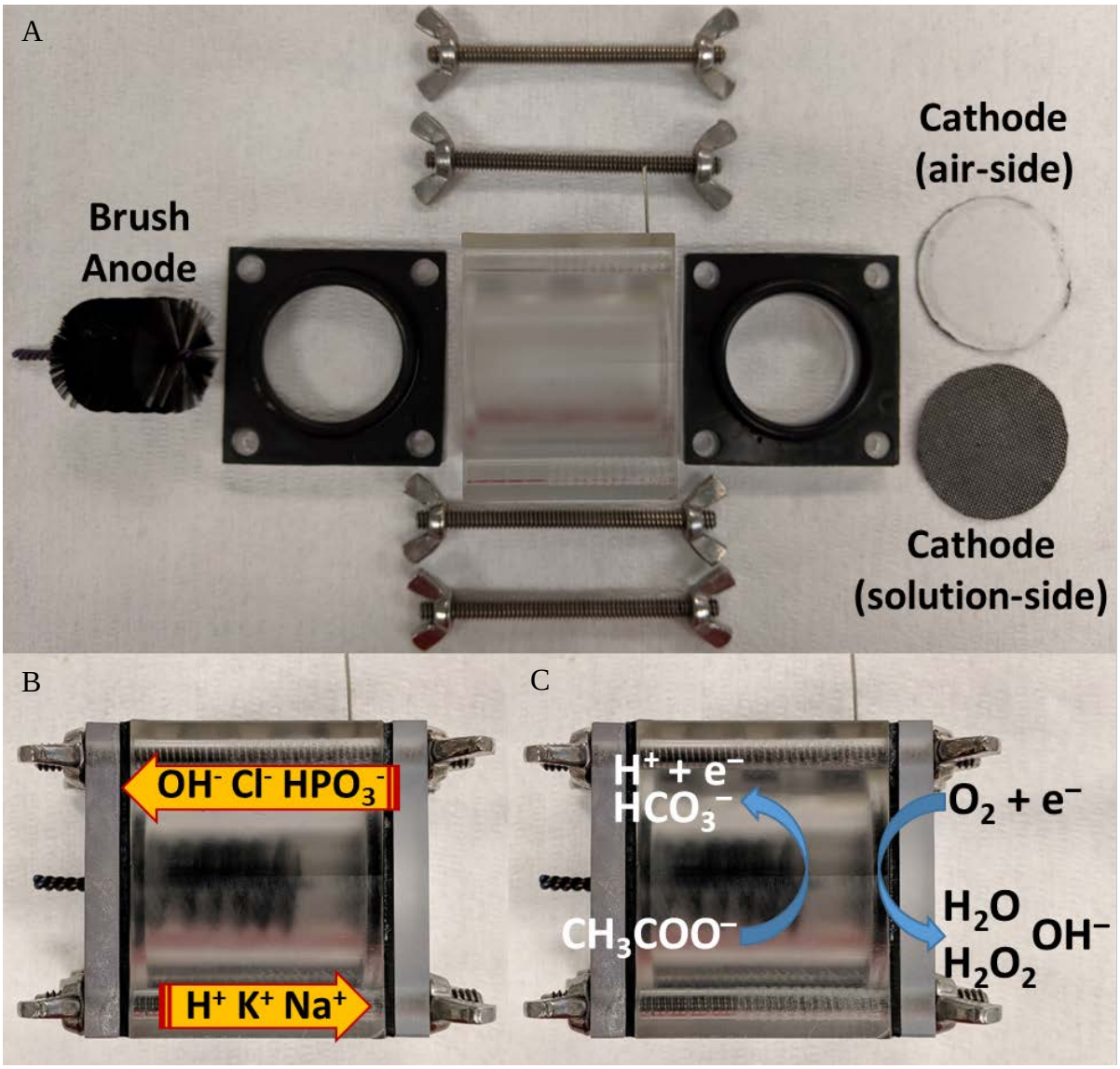

Figure S1. (A) Photograph of the MFC disassembled showing the brush anode and the solution and air side of the cathode. Only one cathode will be inserted in the MFC. Correspondent (B) ions transport and (C) electrochemical reaction in an assembled MFC.

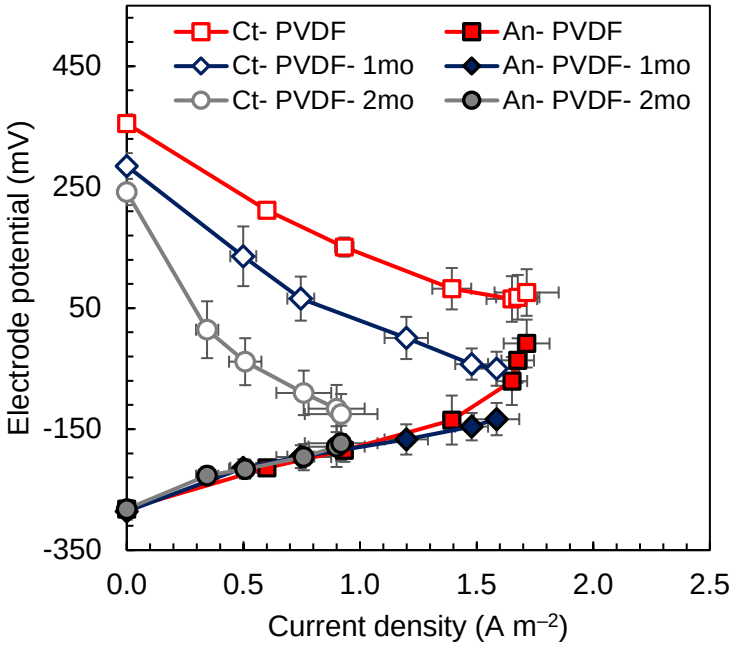

Figure S2. Anode and cathode potentials not corrected for ohmic resistance of the MFCs with PVDF cathodes after one (1 mo) or two (2 mo) months of operation with domestic wastewater.

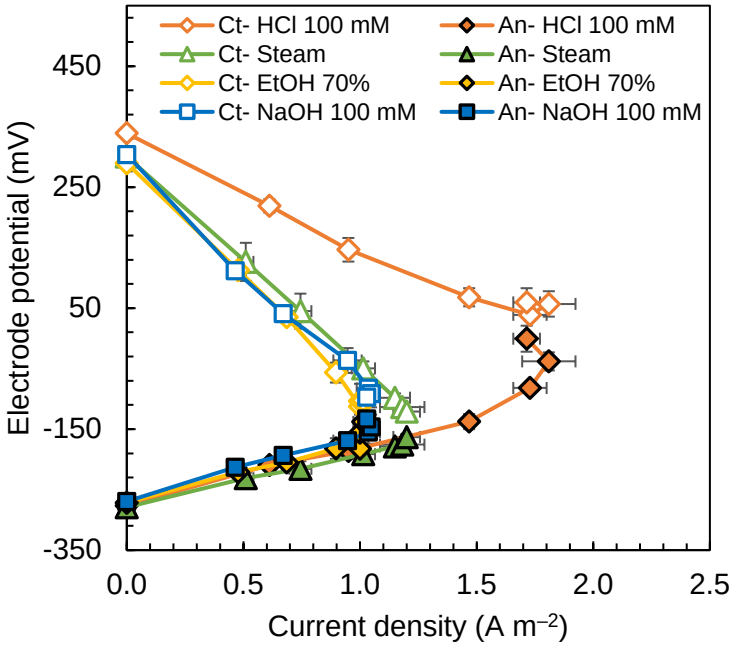

Figure S3. Anode and cathode potentials of the MFCs with PVDF cathodes treated with ethanol (EtOH 70%), steam, sodium hydroxide (100 mM NaOH) and hydrochloric acid (100 mM HCl) not corrected for ohmic resistance after two months of operation.

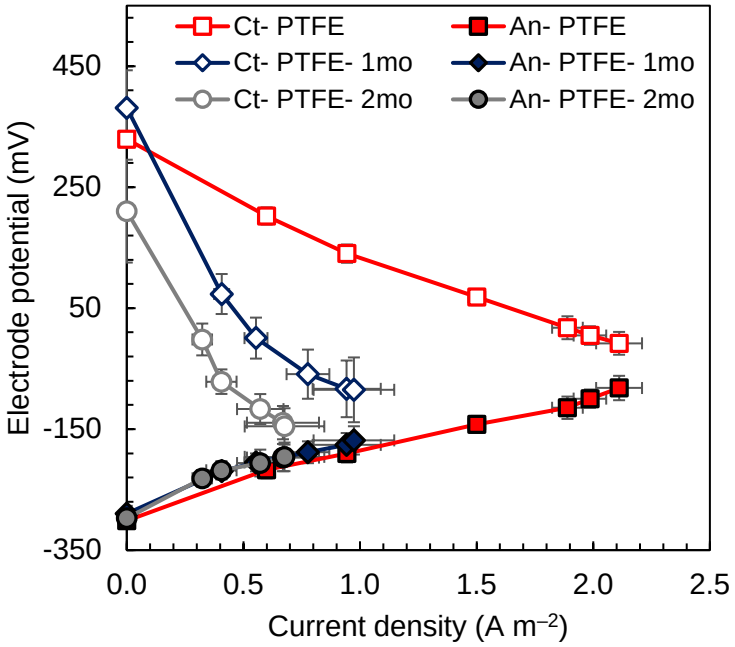

Figure S4. Anode and cathode potentials not corrected for ohmic resistance of the MFCs with PTFE diffusion layer cathodes after one month (1 mo) and two months (2 mo) of operation with domestic wastewater.

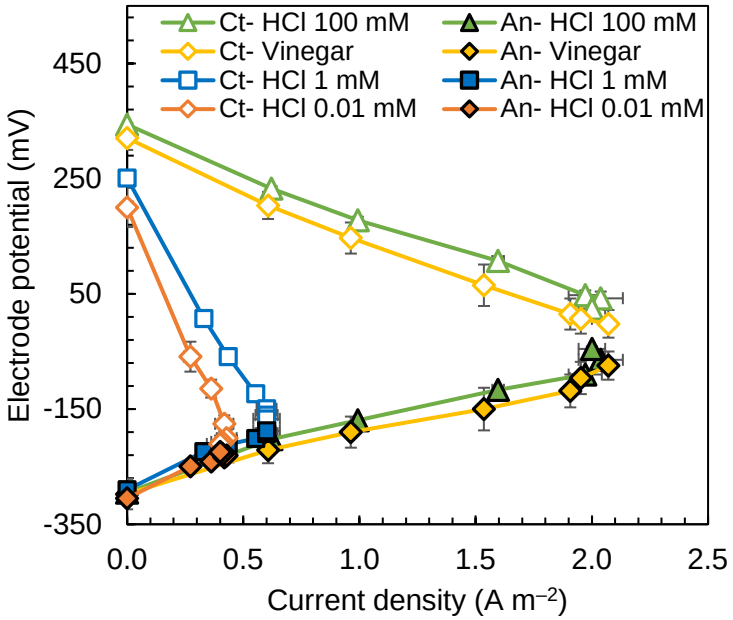

Figure S5. Anode and cathode potentials not corrected for ohmic resistance of the MFCs with PTFE diffusion layer cathodes treated with hydrochloric acid (100 mM HCl, 1 mM HCl, 0.01 mM HCl) and a commercially available vinegar (5% acidity) after two months of operation.

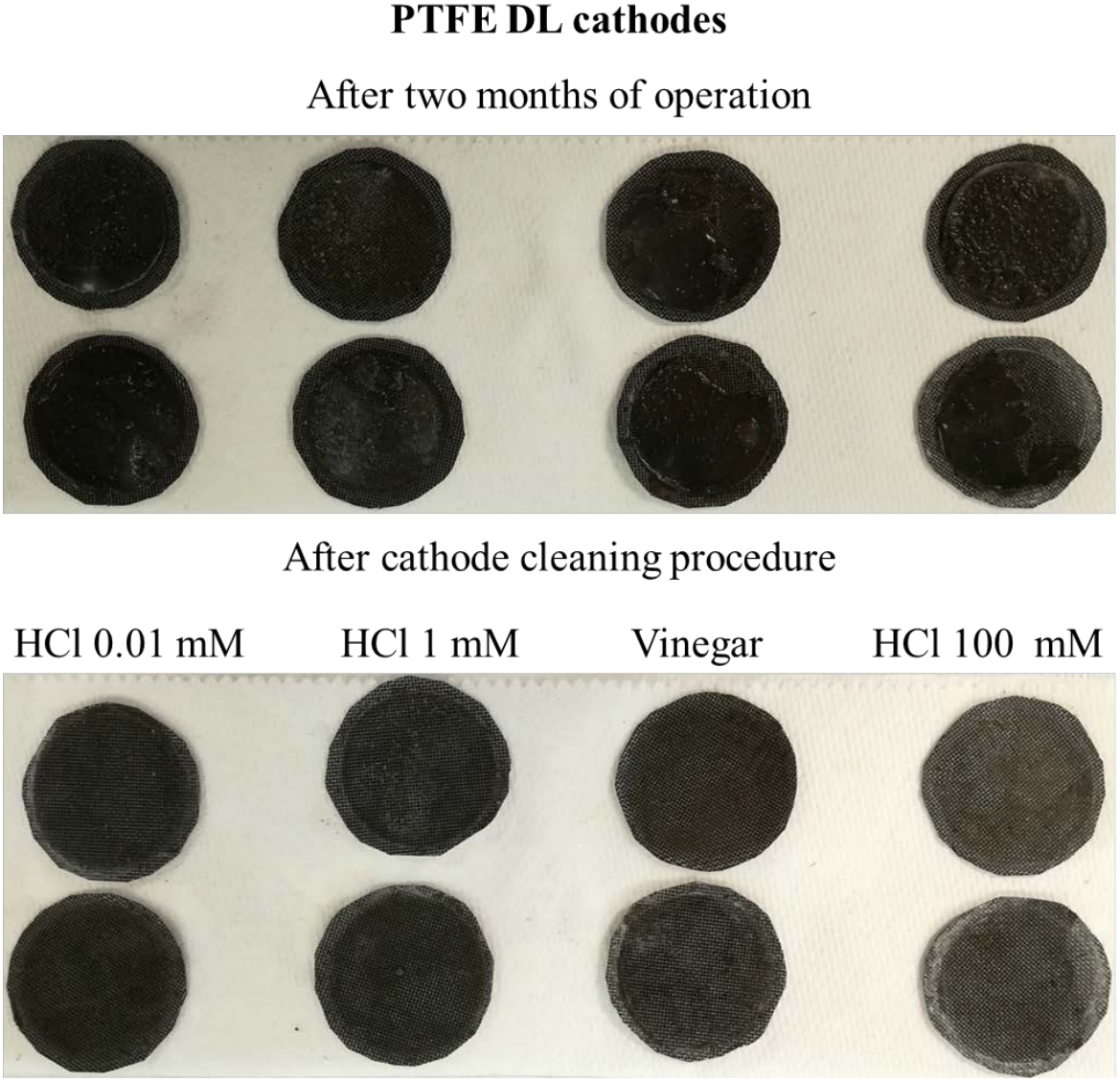

Figure S6. Pictures of the solution side of the PTFE DL cathodes before and after the cleaning procedure.

Table S1. COD and soluble COD measured at each different polarization test recorded.

PVDF DL cathodes		
	COD (mg L^{-1})	Soluble COD (mg L^{-1})
Initial	513 ± 19	270 ± 2
1st month	557 ± 18	252 ± 4
2nd months	535 ± 11	264 ± 5
Cleaning	448 ± 12	230 ± 3

PTFE DL cathodes		
	COD (mg L^{-1})	Soluble COD (mg L^{-1})
Initial	479 ± 10	249 ± 3
1st month	629 ± 13	291 ± 12
2nd months	552 ± 2	200 ± 7
Cleaning	632 ± 18	215 ± 8

Table S2. pH of the solutions used for the acid wash before and after the cleaning procedure.

PTFE DL cathodes		
	pH before soaking	pH after soaking
HCl 100 mM	1.3	1.4
HCl 1 mM	3.0	9.3
HCl 0.01 mM	4.8	9.5
Vinegar (5% acidity)	2.4	3.3

Table S3. Performance of the wastewater fed MFCs in term of maximum power density (P_{max}), anode (R_{An}) and cathode resistance (R_{Cat}) and experimental electrode potential ($E_{An,e0}$; $E_{Cat,e0}$).

PVDF DL cathodes			
	Initial	After 1 month	After 2 months
P_{max} (W m^{-2})	0.30 ± 0.02	0.20 ± 0.03	0.09 ± 0.02
R_{Cat} (mΩ m^2)	70 ± 10	87 ± 36	148 ± 32
R_{An} (mΩ m^2)	93 ± 5	59 ± 3	67 ± 4
$E_{Cat,e0}$ (mV)	307 ± 10	220 ± 31	95 ± 18
$E_{An,e0}$ (mV)	–276 ± 5	–246 ± 3	–253 ± 2

	HCl 100 mM	Steam	NaOH 100 mM	EtOH 70%
P_{max} (W m^{-2})	0.32 ± 0.01	0.19 ± 0.02	0.16 ± 0.01	0.16 ± 0.01
R_{Cat} (mΩ m^2)	74 ± 17	250 ± 1	206 ± 18	264 ± 6
R_{An} (mΩ m^2)	77 ± 7	71 ± 7	83 ± 2	74 ± 2
$E_{Cat,e0}$ (mV)	320 ± 18	305 ± 1	251 ± 13	282 ± 5
$E_{An,e0}$ (mV)	–263 ± 8	–272 ± 5	–255 ± 1	–260 ± 2

PTFE DL cathodes			
	Initial	After 1 month	After 2 months
P_{max} (W m^{-2})	0.32 ± 0.02	0.12 ± 0.02	0.07 ± 0.02
R_{Cat} (mΩ m^2)	54 ± 14	250 ± 62	342 ± 142
R_{An} (mΩ m^2)	77 ± 2	76 ± 6	90 ± 22
$E_{Cat,e0}$ (mV)	286 ± 15	208 ± 37	125 ± 63
$E_{An,e0}$ (mV)	–269 ± 3	–253 ± 4	–260 ± 10

	HCl 100 mM	Vinegar	HCl 1 mM	HCl 0.01 mM
P_{max} (W m^{-2})	0.36 ± 0.01	0.33 ± 0.01	0.08 ± 0.01	0.05 ± 0.01
R_{Cat} (mΩ m^2)	28 ± 8	48 ± 4	487 ± 29	683 ± 124
R_{An} (mΩ m^2)	80 ± 1	68 ± 5	95 ± 12	98 ± 8
$E_{Cat,e0}$ (mV)	310 ± 8	292 ± 5	200 ± 13	158 ± 44
$E_{An,e0}$ (mV)	–257 ± 1	–265 ± 5	–257 ± 5	–278 ± 3