Electronic Supplementary Information (ESI)

PEDOT/$NiFe_2O_4$ nanocomposite on biochar as a free standing anode for high performance and durable microbial fuel cells

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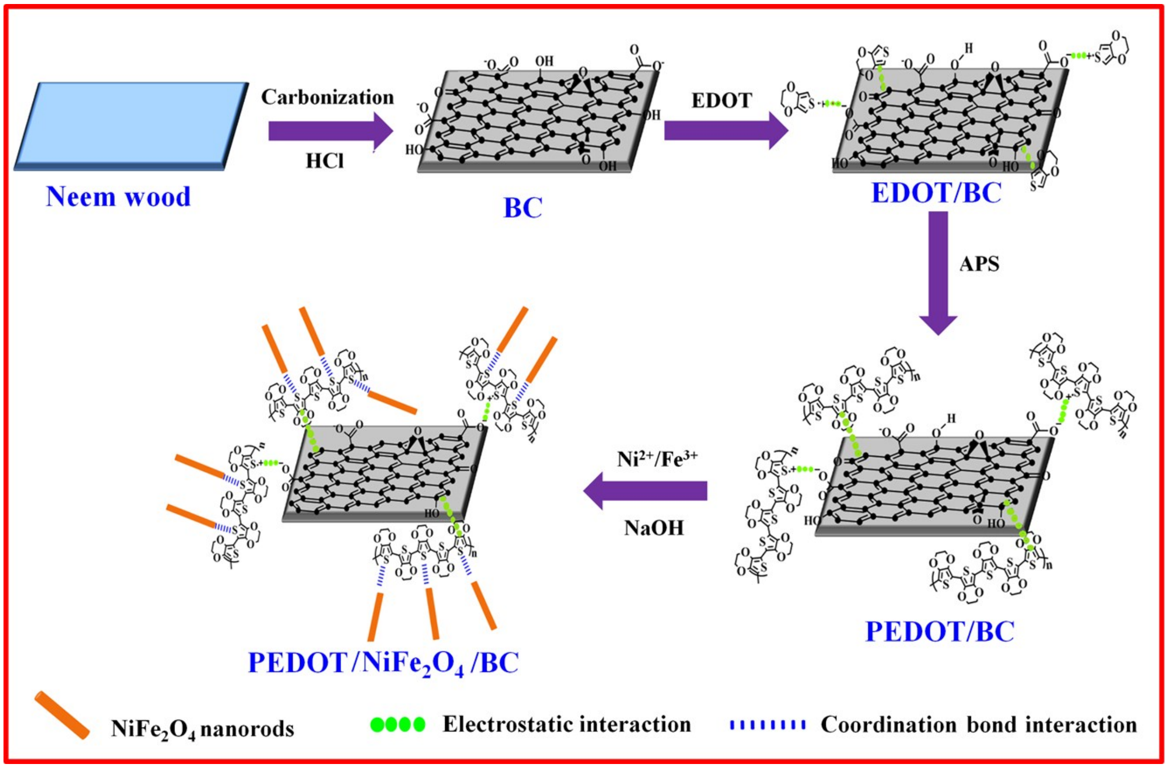

Fig. S1 Proposed mechanism involved in the preparation of PEDOT/$NiFe_2O_4$ nanostructures on BC.

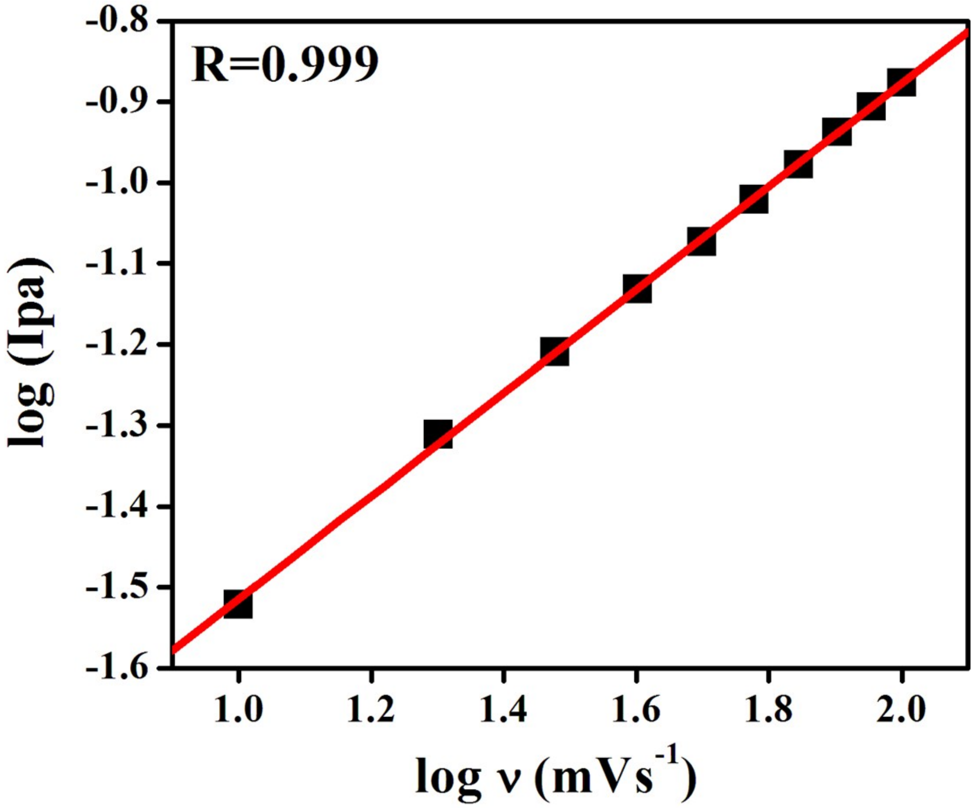

Fig. S2 Calibration plots of log i_p *vs.* log ν acquired from the CVs of PEDOT/$NiFe_2O_4$/BC in the pre-acclimated bacteria inoculated in 50 mM PBS.

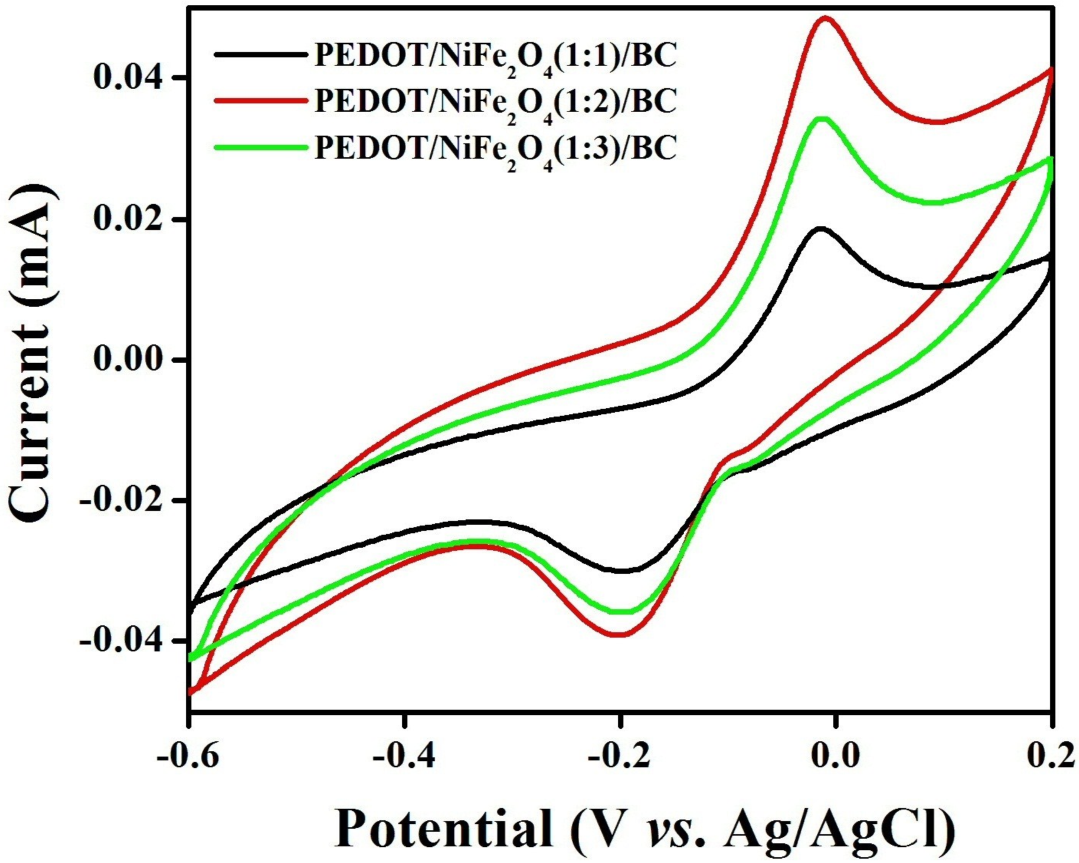

Fig. S3 CV responses of PEDOT/$NiFe_2O_4$/BC with different mass ratios of PEDOT and $NiFe_2O_4$ in the pre-acclimated bacteria inoculated 50 mM PBS at a scan rate of 20 mV s^{-1}.

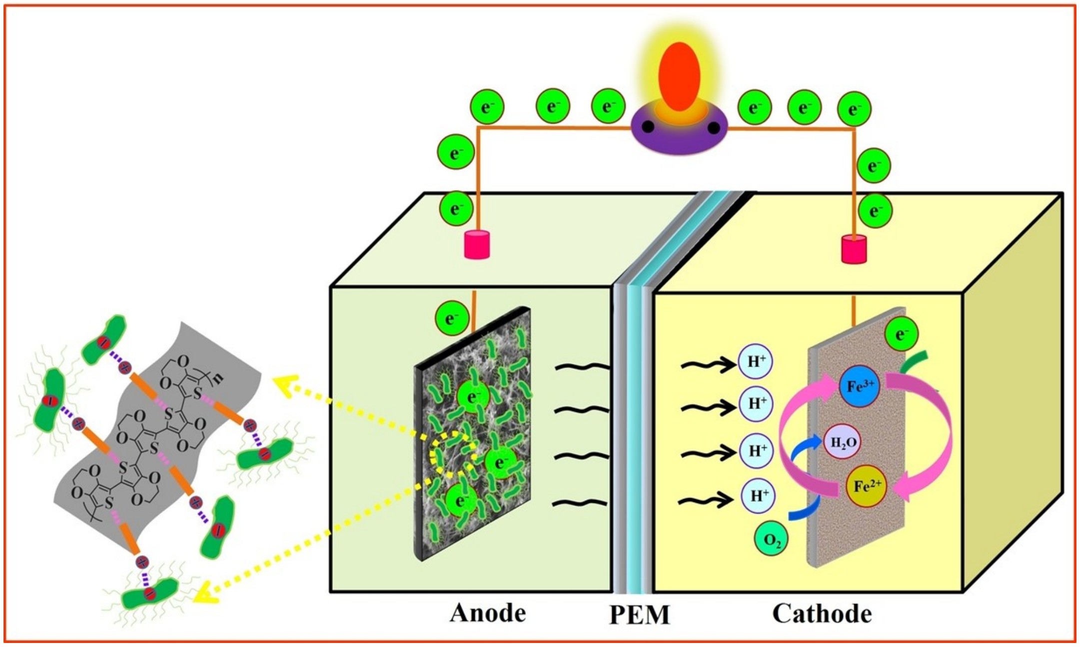

Fig. S4 Schematic representation of the mechanism engaged in harvesting the clean energy from MFC equipped with PEDOT/$NiFe_2O_4$/BC.

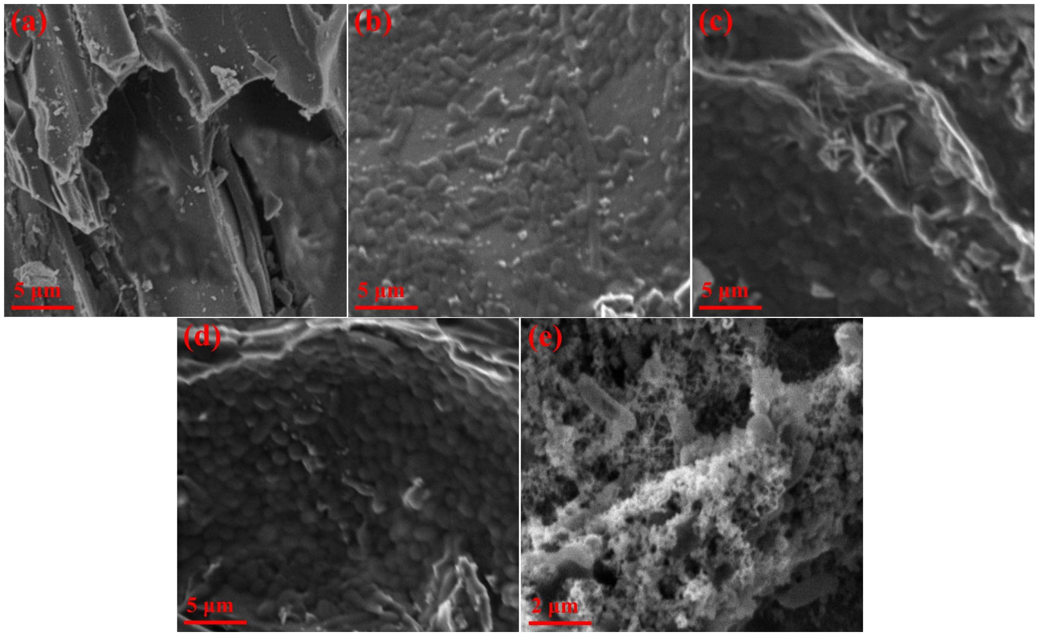

Fig. S5 SEM images of (a) control anode, (b) Fe_3O_4/BC, (c) $NiFe_2O_4$/BC, and (d and e) PEDOT/$NiFe_2O_4$(1:2)/BC after the MFC operation of 350 h.

Table S1. Comparative profile of MFC performances.

Anode	Inoculum	Maximum power density	Maximum current density	Durability (hours)	Reference
HAPNW[a]/CP[b]	*Shewanella loihica*	0.28 mW cm^{-2}	2.9 mA cm^{-2}	≈ 50	1
CNT[c]/CC[d]	*Wastewater*	65 mW m^{-2}	≈ 65 mA m^{-2}	-	2
Pt[e]/Titania plate	*Pre-acclimated effluent*	-	4.6 A m^{-2}	-	3
Fe_3O_4/CP[b]	*Domestic Wastewater*	30 mW m^{-2}	-	≈ 400	4
AC[f]/PANI[g]/D-CSA[h]/GF[i]	*Domestic Wastewater*	30 mW m^{-2}	110 mA m^{-2}	≈ 150	5
Mo[j]/SS[k]	*Aerobic seawater*	23 mW m^{-2}	140 mA m^{-2}	-	6
PANI[g]/CF[l] PAOA[m]/CF[l]	*Anaerobic digester sludge*	27.4 mW m^{-2} 23.8 mW m^{-2}	200 mA m^{-2} 190 mA m^{-2}	- -	7
MWNT[n]/CP[b]	*Anaerobic granular sludge*	290 mW m^{-2}	568 mA m^{-2}	-	8
G[o]/PEDOT[p]/CP[b]	*Escherichia coli*	873 mW m^{-2}	3.59 A m^{-2}	≈ 575	9
PEDOT[p]/Ag[q]	*Shewanella oneidensis*	2.6 μW cm^{-2}	22.5 μA cm^{-2}	≈ 20	10
Fe_3O_4/AC[f]/SSM[r]	*Pre-acclimated effluent*	-	1.9 A m^{-2}	2	11
Fe_3O_4/CC[d]	*Beverage wastewater*	55 mW m^{-2}	-	-	12

PEDOT[p]/PSS[s]/TC[t]	*Pseudomonasae ruginosa*	2.6 μW cm^{-2}	52 μA cm^{-2}	-	13
3D PC[u]	*Shewanella oneidensis MR-1*	245.1 mW m^{-2}	≈ 1270 mA m^{-2}	-	14
PEDOT[p]/PSS[s]/TC[t]	*Pseudomonas aeruginosa*	1 μW cm^{-2}	6.3 μA cm^{-2}	-	15
GI[u]/AC[f]	*Shewanella oneidensis*	1.4 mW m^{-2}	120 mA m^{-2}	-	16
PPy[v]/GF[i]	*leachate garden compost*	25 mW m^{-2}	≈ 110 mA m^{-2}	-	17
CNT[c]/PANI[g]/APTES[w]/ITO	*Shewanella loihica*	34.51 mW m^{-2}	-	-	18
CT[x]	*Pre-acclimated effluent*	-	24.5 A m^{-2}	-	19
PEI[y]/GF[i]	*Saccharomyces cerevisiae*	472.04 mW m^{-2}	1200 mA m^{-2}	≈ 120	20
NCNT[c]/G[o]/CC[d]	*Shewanella putrefaciens*	1137 mW m^{-2}	0.28 μA cm^{-2}	-	21
PEDOT[p]/$NiFe_2O_4$/BC[z]	***Wastewater***	**1200 mW m^{-2}**	**3324 mA m^{-2}**	**350**	**This work**

[a]Hydroxylated and aminated polyaniline nanowire; [b]carbon paper; [c]carbon nanotubes; [d]carbon cloth; [e]platinum; [f]activated carbon; [g]polyaniline; [h]D-camforsulfonic acid (D-CSA); [i]graphite felt; [j]molybdenum; [k]stainless steel; [l]carbon felt; [m]poly(aniline-co-o-aminophenol); [n]multiwalled carbon nanotube; [o]graphene; [p]poly (3,4-ethylenedioxythiophene); [q]silver; [r]stainless steel mesh; [s]polystyrene sulfonate; [t]textile cloth; [u]printed carbon; [u]griphite ink; [v]polypyrrole; [w]aminopropyltriethoxysilane, [x]carbonized waste tire electrodes, [y]polyethyleneimine; [z]biochar.

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