Supplementary Materials

SM. 1. Pre-treatment of ACF

Active carbon fiber was cut into 5cm×6cm specifications. Immerse ACF into 10%wt NaOH and ultrasonic 30min in the ultrasonic cleaner to remove oil stain attached on the ACF. After cleaning by the ultrapure water several times, ACF was submerged into 5%wt HCl for 2h to eliminate metal and other oxides. Rinse ACF to neutral using ultrapure water. Finally, ACF was dried at 80°C for 24h in the oven.

SM. 2. Pre-treatment of g-C_3N_4

Urea was used as the precursor of g-C_3N_4. At first, the proper amount of urea was put into the crucible, dried at 50°C in the oven for 24 hours. After that, 20g baked urea was taken into the crucible with a cover and calcinated in muffle furnace at 550 °C maintained 4h with a heating rate of 4℃/min. Finally, after natural cooling to room temperature, the sample was light yellow solid powder, named as g-$C_3N_{4.}$

SM. 3. Pre-treatment of CNTs

The CNTs were pretreated by nitric acid for removing metal impurity and introducing oxygen functional groups in this study. 1g MWCNTs with a diameter of 10~20nm and a length of 50um was taken into 8mol/L HNO_3 with a volume of 100ml. The mixture was ultrasound for 4h. After diluted with deionized water, CNTs were filtrated by the 0.45um microporous membrane until the CNTs were washed to neutral. Then, CNTs were lyophilized at -70°C in the vacuum freeze dryer for 72h.

SM. 4. Electrochemical measurements

The electrochemical properties of the electrodes were determined by an electrochemical work station (CHI-660E, China). Linear sweep voltammetry (LSV) was performed in a 0.05 M O_2-saturated Na_2SO_4 solution (pH=3.0) from -1.4V to -0.3 V (vs. SCE) at a scan rate of 100 mV s^{-1}. The cyclic voltammetry (CV) curves were conducted in 0.05 M Na_2SO_4 solution with O_2-saturated atmosphere between -1.2V and 1.2 V (vs. SCE) at a scan rate of 100 mV s^{-1}. The electrochemical impedance spectroscopy (EIS) was carried out with open circuit potential in a 0.05 M Na_2SO_4 solution. The amplitude was 5 mV and the frequency range was between 10^{-1} and 10^5 Hz.

SM. 5. Potassium titanium (IV) oxalate method

H_2O_2 concentration was measured at a wavelength of 400nm by the potassium titanium oxalate method using a UV–VIS spectrophotometer (UV-3900). 1 mL water sample was put in a 25 ml cuvette. 4 ml 3 M sulfuric acid and 4 ml 0.05 M titanium potassium oxalate was then added to the cuvette. The mixture was diluted to 25 ml with ultrapure water. After standing for 10 min, the absorbance was measured at the wavelength of 400 nm.

SM. 6. Preparation of different PTFE doping contents on the modified ACF

The different doping contents of PTFE (60wt% dispersion) on modified ACF were 0 ml, 0.18 ml, 0.25 ml, 0.33 ml, 0.45 ml, 0.52 ml. The other preparation steps were totally same with those of g-C_3N_4/CNTs/ACF.

SM. 7. Preparation of g-C_3N_4/ACF and CNTs/ACF

The preparation difference of g-C_3N_4/ACF and CNTs/ACF from g-C_3N_4/CNTs/ACF was only doping materials. g-C_3N_4/ACF was 80 mg g-C_3N_4 0.33 ml 60wt% PTFE dispersed into ultrapure water, while CNTs/ACF was 230 mg CNTs and 0.33 ml 60wt% PTFE dispersed into ultrapure water. The other preparation steps were totally same with that of g-C_3N_4/CNTs/ACF.

Table S1 Standard electrode potentials of some oxidants

Oxidant	Redox Potential (V)	Oxidant	Redox Potential (V)
F_2	3.06	$\cdot HO_2$	1.65
$\cdot OH$	2.80	$HCLO_4$	1.63
O_3	2.07	ClO_2	1.50
H_2O_2	1.77	Cl_2	1.36
$KMnO_4$	1.69	O_2	1.23

Table S2 The characteristics of landfill leachate concentrate

pH	UV_{254}	COD	BOD	TOC	TDS	Cl^-	NH_4-N
-	A	$mg\cdot L^{-1}$	$mg\cdot L^{-1}$	$mg\cdot L^{-1}$	$mg\cdot L^{-1}$	$mg\cdot L^{-1}$	$mg\cdot L^{-1}$
8.5	>10	1625	57	847	33966	5821	83

Table S3 BET surface area, total pore volume and pore size of pristine and modified ACF

	pristine ACF	modified ACF
S_{BET} (m^2/g)	1498.271	1106.561
V_{tol} (cm^3/g)	0.311	0.646
Pore size (nm)	1.784	2.084

Table S4 Kinetic parameters for the removal of FA

	FA degradation					
□	zero order		pseudo-first-order		pseudo-second-order	
Fe^{2+}(mM)	k_1	R^2	k_2	R^2	k_3	R^2
0	0.00263	0.92139	0.00358	0.98088	0.00426	0.98938
0.2	0.00477	0.76377	0.00687	0.96316	0.01452	0.98074
0.4	0.00547	0.73869	0.0119	0.9569	0.02189	0.99076
0.6	0.0059	0.6638	0.01498	0.94426	0.03262	0.98619
0.8	0.0062	0.59532	0.0184	0.93786	0.0489	0.99263
1	0.0056	0.58166	0.01472	0.91683	0.03122	0.96809
1.5	0.00433	0.71414	0.00881	0.93436	0.01254	0.96581

	FA degradation		
	zero order	pseudo-first-order	pseudo-second-order

I(A)	k_1	R^2	k_2	R^2	k_3	R^2
0.1	0.00638	0.76794	0.01572	0.97793	0.0368	0.99779
0.2	0.00631	0.64778	0.01786	0.94935	0.04622	0.99436
0.4	0.00603	0.64977	0.01597	0.94243	0.03678	0.98617
0.5	0.00487	0.70957	0.01003	0.94149	0.01656	0.97548
1	0.00357	0.59907	0.00689	0.89337	0.00958	0.91784

	FA degradation					
	zero order		pseudo-first-order		pseudo-second-order	
pH	k_1	R^2	k_2	R^2	k_3	R^2
1	0.00543	0.57529	0.01393	0.91164	0.02823	0.96127
3	0.0062	0.6021	0.01834	0.94266	0.04885	0.99427
5	0.00583	0.6786	0.0145	0.95165	0.03092	0.99395
7	0.00567	0.747	0.01269	0.96403	0.02453	0.99684
9	0.00497	0.72795	0.01018	0.94755	0.01699	0.98083
11	0.0034	0.75998	0.00572	0.9399	0.00753	0.96041

	FA degradation					
	zero order		pseudo-first-order		pseudo-second-order	
air flux	k_1	R^2	k_2	R^2	k_3	R^2
0.16	0.00497	0.58791	0.00861	0.70567	0.01654	0.81623
0.32	0.00583	0.63917	0.01213	0.83638	0.03048	0.97617
0.56	0.00423	0.72667	0.00638	0.83184	0.01014	0.92105
0.8	0.00357	0.92952	0.00476	0.97166	0.0065	0.99522
1.5	0.0031	0.98491	0.00384	0.99129	0.00482	0.98879

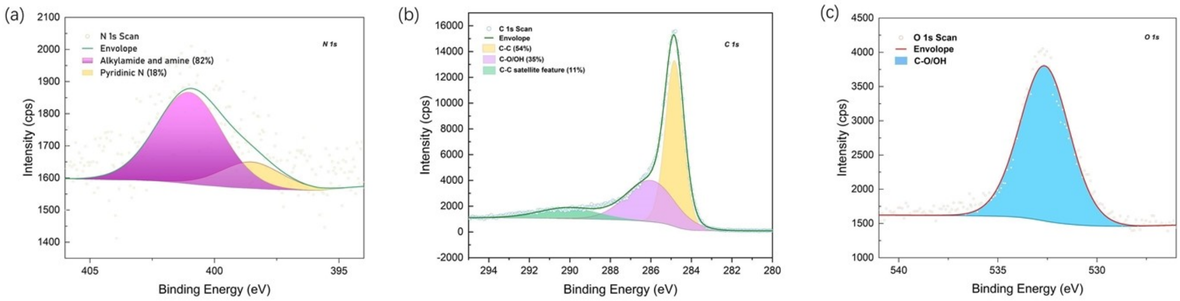

Fig. S1. High resolution spectrum of (a) N 1s, (b) C 1s and (c) O 1s about pristine ACF.

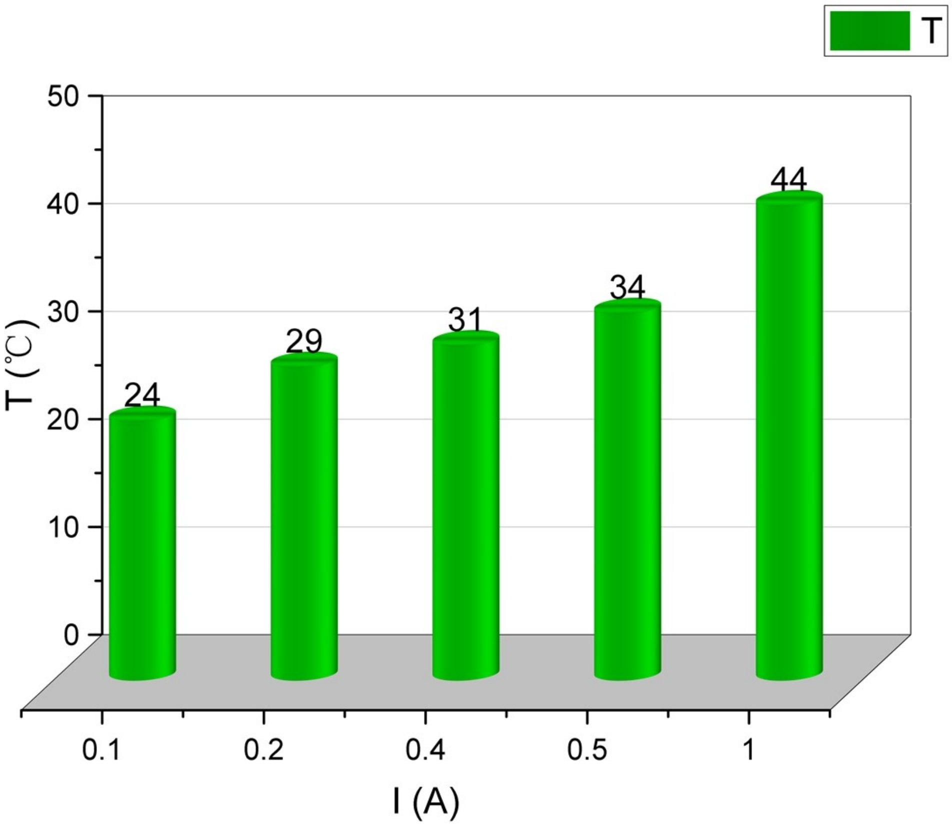

Fig. S2. The change of electrolyte temperature at different current

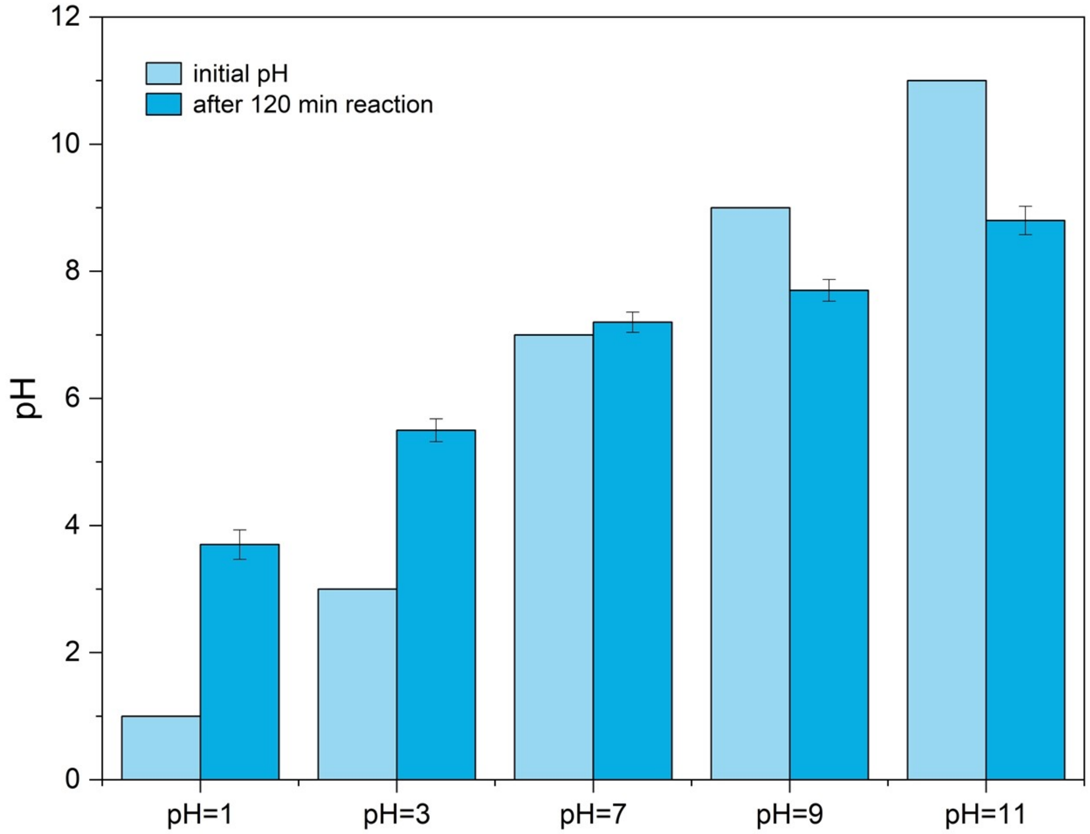

Fig. S3. pH evolution of LLC in EF at different initial pH

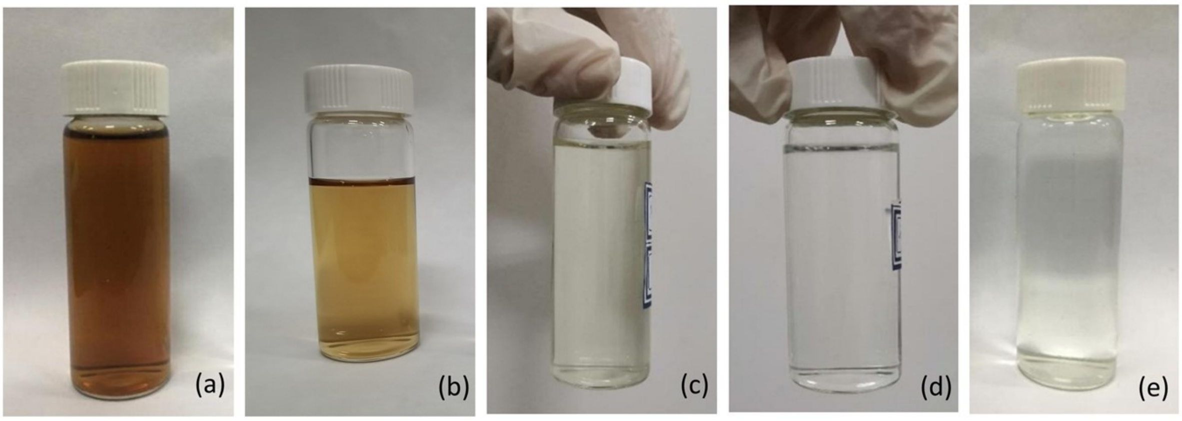

Fig. S4. The appearance of raw landfill leachate concentrate (a), landfill leachate concentrate after pretreated (b), effluent treated by anodic oxidation after 120 min (c), effluent treated by electro-Fenton with pristine ACF after 120 min (d) and effluent treated by electro-Fenton with g-

C_3N_4/CNTs/ACF after 120 min (e).