

*Supporting material for*

**Constructing an in-situ Fenton reaction using iron-air fuel cells with a graphite cathode for landfill leachate treatment**

Sizhuo Wan<sup>1</sup>, Cong Ding<sup>1</sup>, Bingyin Liu<sup>2</sup>, Mahmood Qaisar<sup>3</sup>, Bibi Saima Zeb<sup>3</sup>, Ru Wang (✉)<sup>1</sup>, Linjiang Yuan<sup>1</sup>

1 Shaanxi Key Laboratory of Environmental Engineering, Xi'an University of Architecture and Technology, Xi'an 710055, China

2 Business School, Xi'an International University, Xi'an 710077, China

3 Department of Environmental Sciences, COMSATS University Islamabad, Abbottabad Campus, Abbottabad 22010, Pakistan

---

✉ Corresponding author  
E-mail: R.Wang@xauat.edu.cn

## Captions

**Table S1** Characteristics of landfill leachate.

**Table S2** Comparison of specific surface area and pore structure of different carbon-based catalysts.

**Fig. S1** The constitution of iron-ai fuel cell.

**Fig. S2** The polarization and power density curves of different catalyst.

**Fig. S3** The output voltages of different cathode catalyst.

**Fig. S4** Comparison of output voltages with electrolyte of 10 g/L Na<sub>2</sub>SO<sub>4</sub> and landfill leachate.

**Fig. S5** The change of zeta potential and pH during the reaction time.

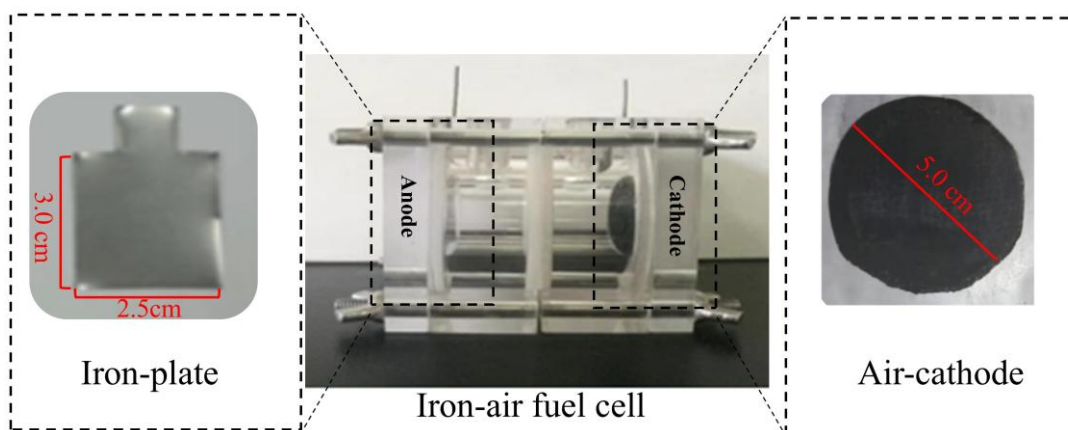
**Fig. S6** The generation of Fe<sup>2+</sup> (a) and remaining Fe<sup>2+</sup> (b) over the reaction duration in the absence of tert-butanol.

**Table S1** Characteristics of landfill leachate.

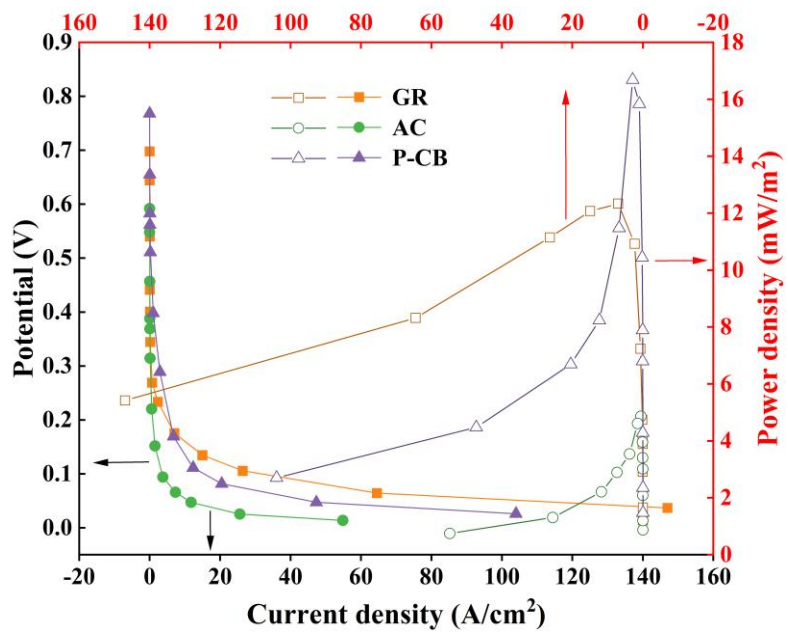
Parameters	Concentrations	Parameters	Concentrations
pH	6.9 ± 0.5	COD	1879.1 ± 163.4 mg/L
ORP	206.0 ± 15 mV	NH <sub>4</sub> <sup>+</sup> -N	2862.4 ± 132.5 mg/L
Conductivity	21.6 ± 0.5 mS/cm	NO <sub>3</sub> <sup>-</sup> -N	48.7 ± 0.5 mg/L
Dissolved oxygen	0.5 ± 0.3 mg/L	NO <sub>2</sub> <sup>-</sup> -N	4.79 ± 0.5 mg/L
Turbidity	59.4 NTU	PO <sub>4</sub> <sup>3-</sup> -P	11.367 mg/L
Fe <sup>2+</sup>	1.13 ± 1.13 mg/L	Mg <sup>2+</sup>	-

**Table S2** Comparison of specific surface area and pore structure of different carbon-based catalysts.

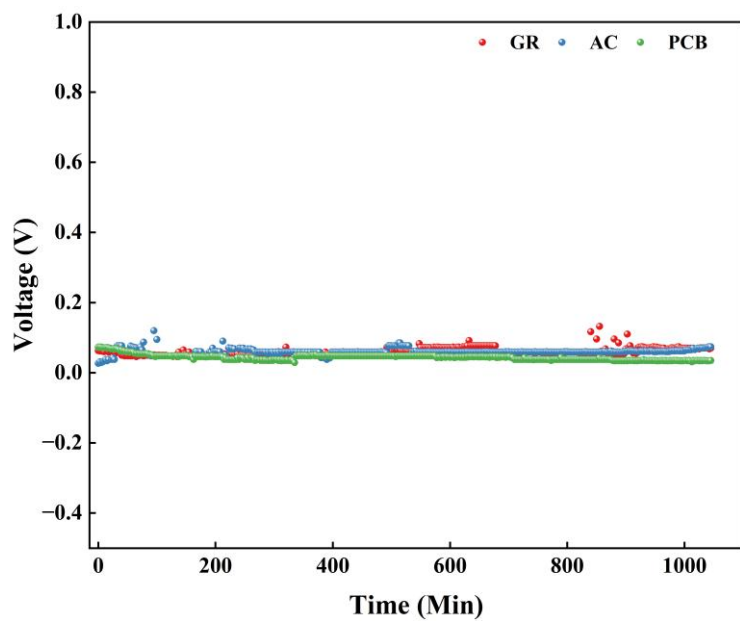
Parameters	GR	AC	PCB
Multipoint specific surface area (m <sup>2</sup> /g)	10.8278	25.6779	1370.89
t-Plot micropore Area (m <sup>2</sup> /g)	1.927	2.47682	57.623
t-Plot micropore volume (cm <sup>3</sup> /g)	0.0001446	0.001206	0.026572
BJH Adsorption cumulative volume (cm <sup>3</sup> /g)	0.072	0.054816	2.63384
BJH Desorption cumulative volume (cm <sup>3</sup> /g)	0.071	0.059748	2.70737
Pore width (nm)	22.140	7.82393	7.44151



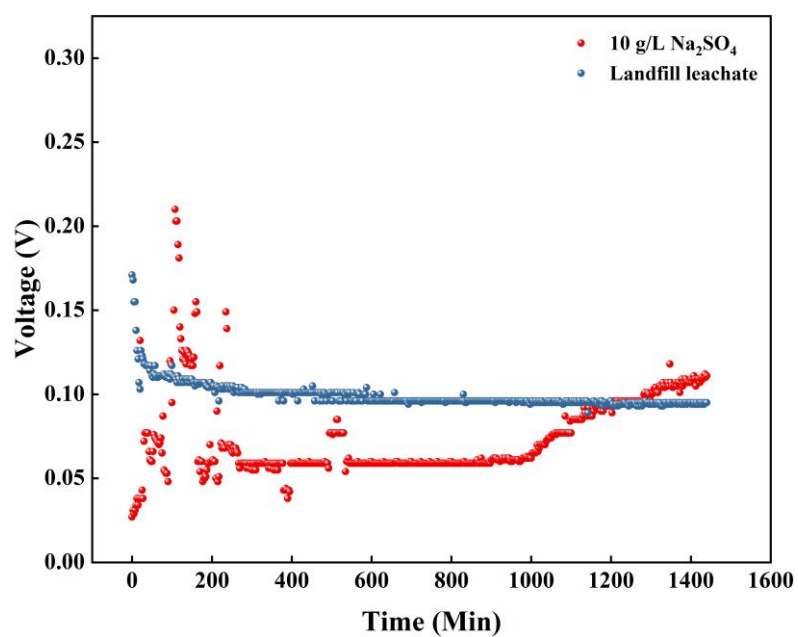
**Fig. S1** The constitution of iron-ai fuel cell.



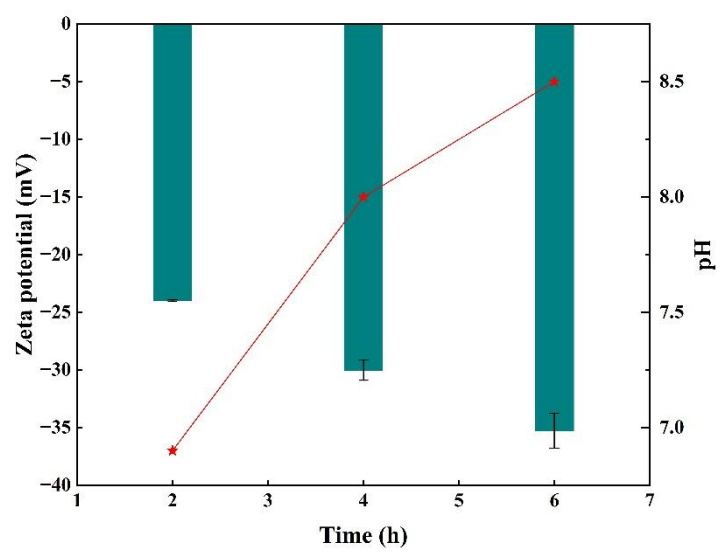
**Fig. S2** The polarization and power density curves of different catalyst.



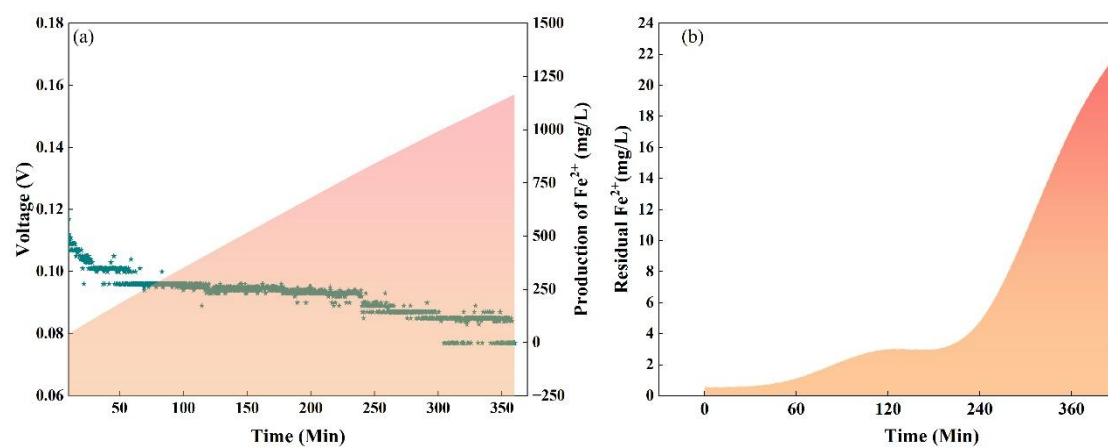
**Fig. S3** The output voltage of different cathode catalyst.



**Fig. S4** Comparison of output voltages with electrolyte of 10 g/L Na<sub>2</sub>SO<sub>4</sub> and landfill leachate.



**Fig. S5** The change of zeta potential and pH during the reaction time.



**Fig. S6** The generation of  $\text{Fe}^{2+}$  (a) and remaining  $\text{Fe}^{2+}$  (b) over the reaction duration in the absence of tert-butanol.