Supplementary Materials

Supporting Methods

The adsorption of phenol by carbon

The adsorption of phenol by carbon was tested. 118 mL bottles were used. The bottles were prepared at phenol 1000 mg/L with 10 g/L H260, H320, P500, P700, and deionized water was added to achieve final working volume 60 mL. The pH was controlled at 7.5 by adjusting with 2M NaOH and HCl. All the bottles were keeped 37 ^{o}C. The supernatant was periodically taken out to measure the concentration of phenol until the phenol concentration was constant. The adsorption tests were prepared in triplicates and performed in a batch mode.

Other analytical methods

The modified Gompertz model (eq.S1) was applied to quantitatively analyze the methane production with different carbon materials.

$$M\,(t) = P\ \times \exp\left\{-exp\left[\frac{R_m\ \times e}{P}\ \times\ (\lambda - t)\ + 1\right]\right\} \qquad \text{(S1)}$$

Where, M(t) is the cumulative methane production (mL) at time t, P is the maximum CH_4 potential (mL CH_4), R_m is the maximum CH_4 production rate (mL/d), λ is the lag-phase time (d), and e is 2.71828. The three parameters, P, R_m, and λ were estimated through global curve fitting using Origin2021 with a minimum residual sum of squared errors between the experimental data and model curves.

Table S1. Phenol adsorption capacity of carbon materials

	H260	H320	P500	P700
adsorption capacity mg/g	38.27796	47.68902	50.1762	65.65834

Table S7. The Pearson analysis of the correlation between Rm and GBs ($p<0.05$)

GB	Correlation Coefficient	P value
JAAYED01 sp.FDU002	0.962	0.009
UBA5829 sp.FDU003	0.96	0.010
JACIYB01 sp.FDU005	-0.895	0.040
RBG-16-66-30 sp.FDU009	-0.974	0.005
DTU080 sp.FDU010	-0.969	0.006
JABLXH01 sp.FDU019	-0.974	0.005
Aminivibrio sp009929115 FDU030	-0.893	0.041
UBA1383 sp002304945 FDU043	-0.92	0.027
UBA8910 sp012517485 FDU045	-0.937	0.019
Syner-03 sp002316795 FDU047	-0.956	0.011
UBA5266 sp002411545 FDU050	-0.995	0.000
Syntrophorhabdus sp.FDU062	-0.893	0.042
RBG-16-64-13 sp.FDU077	0.981	0.003
UBA2241 sp.FDU081	-0.967	0.007
Methanothrix soehngenii FDU082	0.924	0.025
SLSP01 sp.FDU089	0.949	0.014
UBA5500 sp.FDU099	-0.88	0.049
DTU098 sp002305915 FDU100	-0.995	0.000
JAAYDC01 sp.FDU104	0.953	0.012
Methanobacterium sp.FDU106	-0.908	0.033
DTIW01 sp.FDU109	0.995	0.000
JACIYD01 sp.FDU114	0.97	0.006
Proteiniphilum saccharofermentans FDU115	-0.895	0.040
DSUL01 sp.FDU122	-0.93	0.022
UBA2219 sp.FDU124	-0.951	0.013
JAAYAV01 sp.FDU126	-0.904	0.035
UBA6126 sp.FDU137	0.896	0.039

UBA2279 sp.FDU144	0.916	0.029
DTKZ01 sp.FDU153	-0.934	0.020
PALSA-986 sp.FDU155	-0.958	0.010
RBG-16-64-13 sp.FDU161	-0.952	0.013
RBG-16-64-13 sp.FDU169	0.996	0.000
Aminobacterium colombiense FDU170	-0.909	0.033
UBA5072 sp.FDU171	-0.879	0.049
JAAZJW01 sp012519835 FDU174	-0.971	0.006
UBA11386 sp.FDU177	0.932	0.021
Methanolinea sp.FDU180	-0.885	0.046
UBA8910 sp002069605 FDU181	-0.969	0.007
JAAYEA01 sp012689325 FDU183	0.982	0.003
B3-TA06 sp012517375 FDU192	-0.979	0.004
Bryobacteraceae sp.FDU199	-0.982	0.003
UBA1419 sp002305585 FDU201	-0.893	0.041
UBA2241 sp.FDU202	-0.916	0.029
Fen-1342 sp.FDU205	-0.902	0.036
Bact-08 sp009929175 FDU206	-0.974	0.005
UBA4810 sp002418825 FDU208	0.971	0.006