Supplementary Information

Response of chlorinated hydrocarbons transformation and microbial community structure in the aquifer to joint H_2 and O_2

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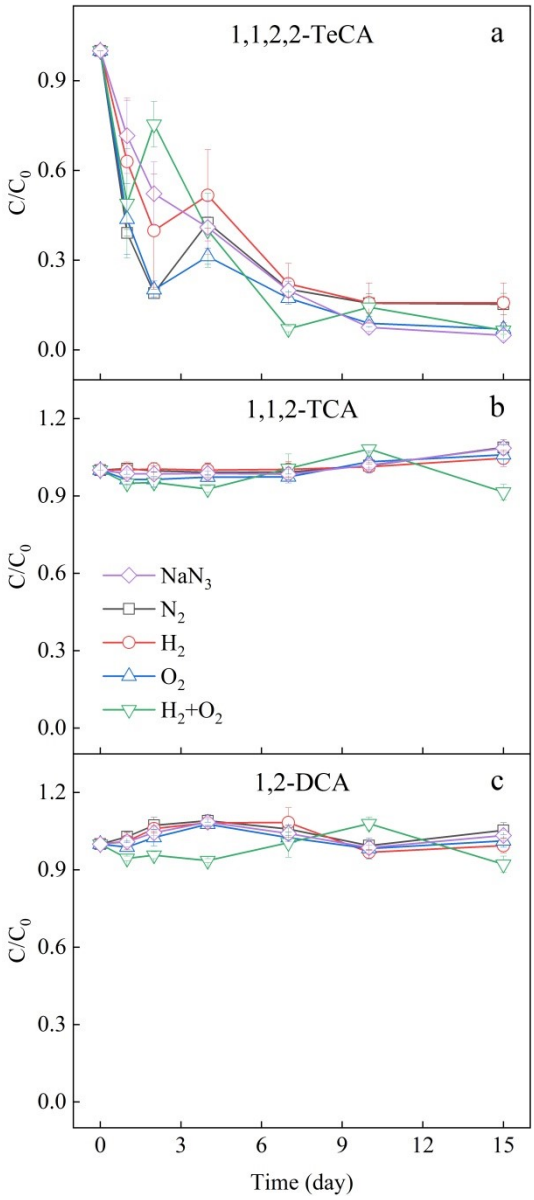

Fig. S1 Concentrations of chlorinated ethanes (1,1,2,2-TeCA (a), 1,1,2-TCA (b), 1,2-DCA (c)) with time in different microcosms of H_2 and O_2 microcosms and with NaN_3 as abiotic control

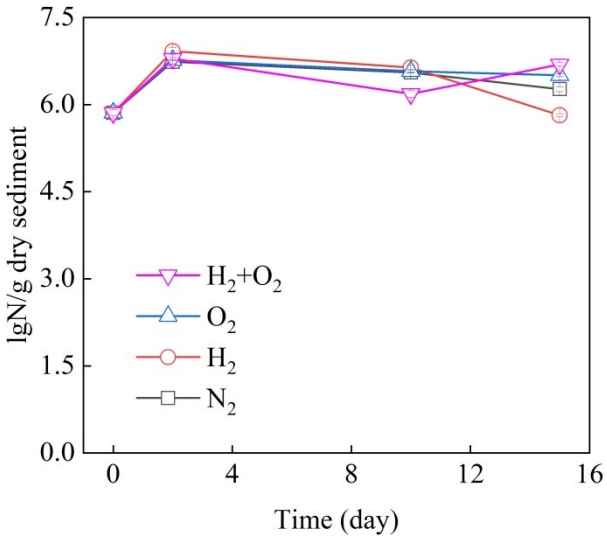

Fig. S2 Microbial numbers in different times of incubation in the four microcosms

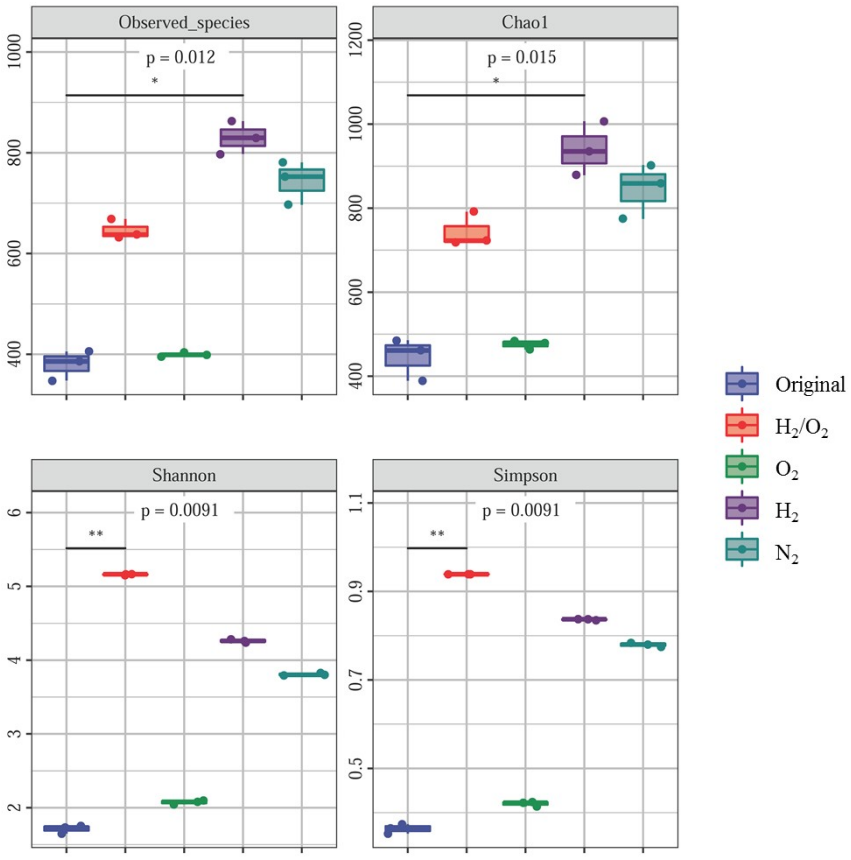

Fig. S3 Microbial diversity indices of the sediments before and after 15-days of incubation in the four microcosms

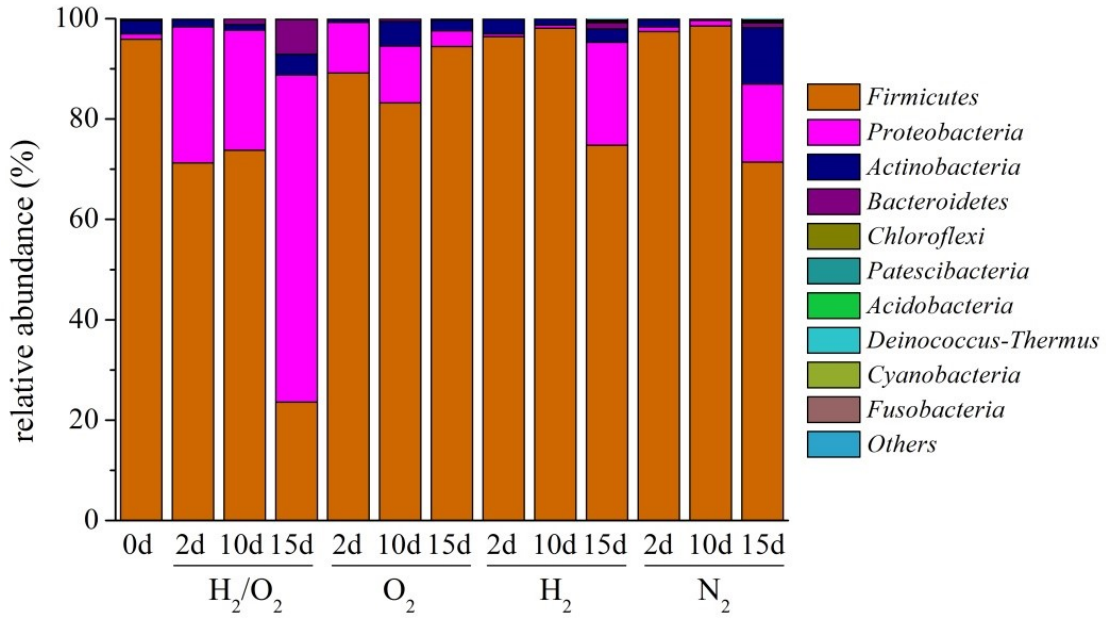

Fig. S4 Microbial composition at phylum level in different experimental microcosms

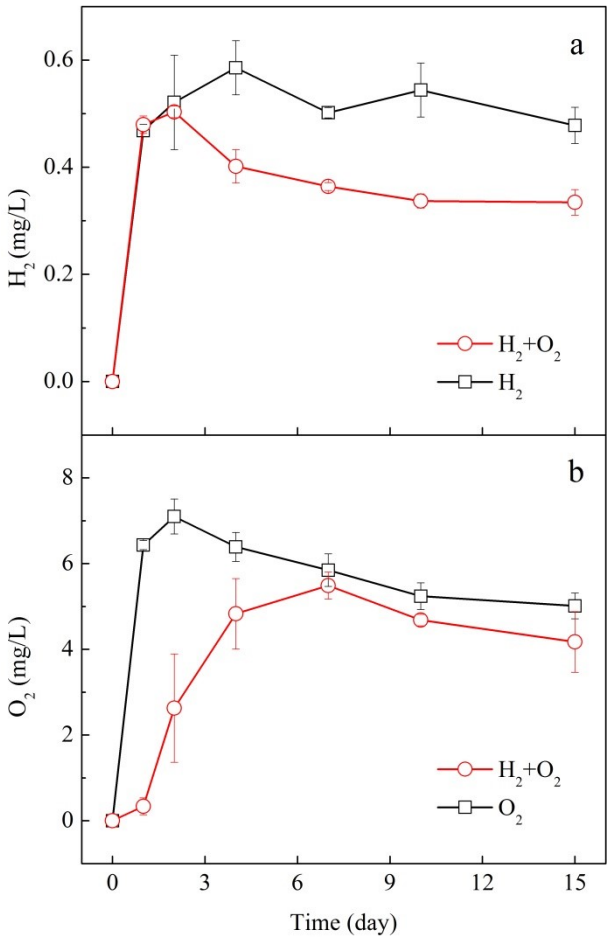

Fig. S5 Variations of H_2 (a) and O_2 (b) concentrations during chlorinated hydrocarbons degradation

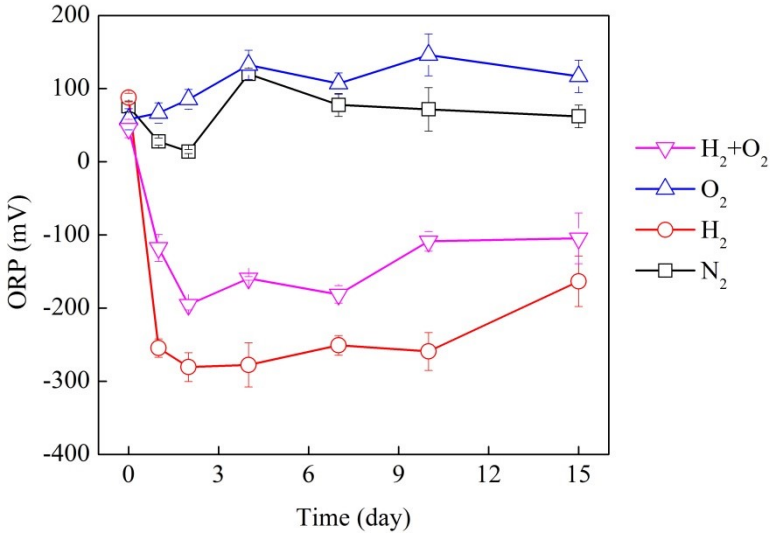

Fig. S6 Variations of oxidation-reduction potential (ORP) during chlorinated hydrocarbons degradation

34 **Table S1 Sediments properties used in this study**

Contaminant	Concentration (mg/kg)	Cation	Concentration (mg/g)	Anion	Concentration (mg/kg)
Perchloroethylene	2.78±0.22	Fe	13.14	Cl^-	189.44
Trichloroethylene	171.41±0.84	K	2.37	SO_4^{2-}	66.05
cis-Dichloroethene	88.51±14.42	Na	0.62	NO_3^-	34.64
trans-Dichloroethene	0.78±0.07	Ca	20.79	PO_4^{3-}	20.12
Vinyl chloride	12.1±1.75	Mg	7.39	F^-	24.31
1,1,2-Trichloroethane	2.75±0.32	P	0.32		
1,2-Dichloroethane	4.46±0.73	Al	9.81		
1,1-Dichloroethane	1.38±0.19	Mn	0.32		
Chloroform	0.29±0.04	Si	33.57		
Chlorobromomethane	0.28±0.03	Li	2.37		
		Ti	0.38		

35 **Note:** TOC content of sediments was 1360 mg/kg, pH value was 7.4.

Table S2 Material balance and variance analysis of CHCs in microcosms

Pollutants	Conditions	Concentration (μM)			Transformation rate (%)	P-value	
		0 day	15 day	variation			
Perchloroethylene	N_2+NaN_3	47.36±1.43	30.62±0.14	-16.74	-35.35	3.53E-05	**
	N_2	43.86±4.56	29.44±0.68	-14.42	-32.88	5.63E-03	**
	H_2	52.38±3.64	29.89±0.89	-22.49	-42.94	4.82E-04	**
	O_2	41.10±2.92	21.84±0.72	-19.26	-46.86	3.76E-04	**
	H_2+O_2	30.15±0.41	20.95±1.33	-9.2	-30.51	3.35E-04	**
Trichloroethylene	N_2+NaN_3	27.14±0.65	48.46±0.48	21.32	78.56	7.26E-04	**
	N_2	40.56±3.15	35.99±4.2	-4.57	-11.27	0.21	
	H_2	43.31±2.48	36.22±3.32	-7.09	-16.37	4.14E-02	*
	O_2	40.10±3.42	40.54±4.56	0.44	1.10	0.90	
	H_2+O_2	40.56±3.15	23.49±2.34	-17.07	-42.09	1.66E-03	**
trans-Dichloroethene	N_2+NaN_3	31.45±0.81	31.23±0.36	-0.22	-0.70	0.70	
	N_2	29.67±1.75	30.71±0.56	1.04	3.51	0.38	
	H_2	32.80±1.56	30.60±0.93	-2.2	-6.71	0.10	
	O_2	30.21±1.45	26.50±0.16	-3.71	-12.28	1.14E-02	*
	H_2+O_2	26.79±0.47	12.20±0.55	-14.59	-54.46	4.01E-06	**
Carbon tetrachloride	N_2+NaN_3	31.92±1.09	24.22±2.11	-7.7	-24.12	4.94E-03	**
	N_2	28.56±2.18	15.46±0.65	-13.1	-45.87	5.68E-04	**
	H_2	33.55±2.63	9.64±0.48	-23.91	-71.27	1.02E-04	**
	O_2	27.39±1.52	21.97±0.73	-5.42	-19.79	5.12E-03	**
	H_2+O_2	34.15±0.84	25.87±1.11	-8.28	-24.25	4.91E-04	**
Chloroform	N_2+NaN_3	33.80±0.82	34.68±0.53	0.88	2.60	0.20	
	N_2	33.28±1.10	37.70±0.42	4.42	13.28	2.90E-03	**
	H_2	32.55±0.70	40.82±1.25	8.27	25.41	5.57E-04	**
	O_2	31.68±1.16	31.86±0.29	0.18	0.57	0.81	
	H_2+O_2	35.77±0.94	28.49±0.97	-7.28	-20.35	7.39E-04	**
Dichloromethane	N_2+NaN_3	28.33±1.72	29.81±0.69	1.48	5.22	0.24	
	N_2	28.02±0.95	31.71±0.74	3.69	13.17	6.06E-03	**
	H_2	29.18±0.90	30.47±1.14	1.29	4.42	0.20	
	O_2	29.86±1.16	30.19±0.61	0.33	1.11	0.69	
	H_2+O_2	24.80±0.40	22.27±0.92	-2.53	-10.20	1.21E-02	*
1,1,2,2-Tetrachloroethane	N_2+NaN_3	28.81±3.90	1.38±0.35	-27.43	-95.21	2.66E-04	**
	N_2	30.67±1.14	4.70±1.14	-25.97	-84.68	9.77E-06	**
	H_2	26.86±2.89	4.28±2.08	-22.58	-84.07	3.90E-04	**
	O_2	26.39±2.72	1.83±0.16	-24.56	-93.07	9.85E-05	**
	H_2+O_2	24.56±4.23	1.61±0.36	-22.95	-93.44	7.25E-04	**
1,1,2-Trichloroethane	N_2+NaN_3	29.10±0.44	31.58±0.08	2.48	8.52	6.40E-04	**
	N_2	28.98±0.60	31.52±0.27	2.54	8.76	2.64E-03	**
	H_2	28.90±1.04	30.22±1.27	1.32	4.57	0.24	
	O_2	28.88±1.17	30.57±0.30	1.69	5.85	0.07	
	H_2+O_2	24.69±0.63	22.57±0.35	-2.12	-8.59	7.18E-03	**
1,2-Dichloroethane	N_2+NaN_3	28.99±0.54	29.96±0.10	0.97	3.35	3.83E-02	*
	N_2	29.23±0.47	30.77±0.50	1.54	5.27	1.78E-02	*
	H_2	30.03±0.94	29.84±1.28	-0.19	-0.63	0.85	
	O_2	29.88±0.93	30.23±0.21	0.35	1.17	0.56	
	H_2+O_2	25.52±0.36	23.51±0.66	-2.01	-7.88	9.69E-03	**

*** Significance at P < 0.05, ** Significance at P < 0.01**