

Supporting Materials

Table S1 The analyses were performed using methods described by Chinese standard

Project	Chinese standard
PM, H ₂ S, ME, DMS, DMDS, CS ₂ , NH ₃ , TMA and Styrene in Stench emission indices after the pre-treatment	Emission standards for odor pollutants, released by Standardization Administration of China in 1994
PM, SO ₂ , NO _x , NH ₃ , HCl, HF and TOC, heavy metals and PCDD/Fs in flue gas and bypass flue gas	Standard for pollution control on co-processing of solid wastes in cement kiln, released by Standardization Administration of China in 2013
Heavy metals concentrations in the cement products	Technical specification for co-processing of solid waste in cement kiln, released by Standardization Administration of China in 2014
Raw meal (RM) and clinker (CK) compositions	Portland Cement Clinker, released by Standardization Administration of China in 2008

Notes: PM particulate matter, TH total hydrocarbons (calculated from the carbon content), Me methanethiol, DMS dimethyl sulfide, DMDS dimethyl disulfide, TMA trimethylamine

1 Table S2 Calorific values (Qnet) and other parameters for the municipal solid waste (MSW), refuse derived fuel (RDF), and coal

Sample	Plant	M _{ar} (%)	A _{ar} (%)	V _{ar} (%)	FC _{ar} (%)	Q _{net,ar} (kcal/kg)	C _{ar} (%)	H _{ar} (%)	N _{ar} (%)	S _{ar} (%)	O _{ar} (%)	Cl _{ar} (%)	F _{ar} (%)
MSW	A	56.39 ±	28.79 ±	12.63 ±	2.18 ±	278.20 ±	6.21 ±	0.85 ±	0.34 ±	0.16 ±	7.26 ±	0.29 ±	0.01 ±
		0.12	0.24	0.33	0.18	9.25	0.39	0.05	0.02	0.01	0.55	0.01	0.01
	B	58.12 ±	18.24 ±	20.12 ±	3.52 ±	815.74 ±	11.26 ±	1.31 ±	0.48 ±	0.09 ±	10.49 ±	0.58 ±	0.02 ±
		0.39	0.18	0.44	0.08	8.23	0.12	0.05	0.04	0.01	0.45	0.02	0.01
	C	55.65 ±	26.13 ±	16.01 ±	2.21 ±	729.70 ±	10.92 ±	1.26 ±	0.41 ±	0.17 ±	5.47 ±	0.45 ±	0.01 ±
		0.12	0.04	0.21	0.07	8.21	0.09	0.01	0.03	0.02	0.04	0.01	0.01
RDF	A	43.84 ±	28.61 ±	24.44 ±	3.12 ±	1472.89 ±	13.08 ±	1.88 ±	0.63 ±	0.29 ±	11.67 ±	0.31 ±	0.01 ±
		0.21	0.08	0.11	0.09	12.44	0.08	0.04	0.08	0.03	0.08	0.02	0.01
	B	53.00 ±	21.32 ±	22.48 ±	3.51 ±	1156.58 ±	14.62 ±	1.64 ±	0.53 ±	0.13 ±	9.07 ±	0.18 ±	0.01 ±
		0.42	0.07	0.14	0.08	11.92	0.09	0.02	0.03	0.01	0.11	0.01	0.01
Coal	A ₁ -Ba	1.04 ±	24.07 ±	24.07 ±	51.49 ±	5708.54 ±	57.33 ±	2.22 ±	0.21 ±	0.12 ±	2.59 ±	0.16 ±	0.01 ±
		0.11	0.21	0.19	9.18	12.79	1.22	0.08	0.02	0.02	0.06	0.03	0.01
	A ₁ -Co	1.00 ±	23.60 ±	23.60 ±	52.23 ±	5750.09 ±	57.20 ±	2.11 ±	0.19 ±	0.13 ±	2.61 ±	0.16 ±	0.01 ±
		0.11	0.09	0.17	5.13	23.55	1.62	0.05	0.01	0.03	0.07	0.02	0.01
	A ₂ -Co	1.06 ±	19.02 ±	19.02 ±	52.65 ±	6176.01 ±	57.45 ±	2.18 ±	0.23 ±	0.13 ±	2.62 ±	0.18 ±	0.01 ±
		0.12	0.26	0.16	0.14	14.65	0.98	0.07	0.05	0.01	0.12	0.04	0.01
B-Ba	2.07 ±	19.83 ±	19.83 ±	48.20 ±	5951.42 ±	55.32 ±	3.25 ±	0.33 ±	0.09 ±	3.46 ±	0.33 ±	0.01 ±	

	0.21	0.21	0.14	1.18	10.98	1.43	0.15	0.04	0.02	0.15	0.06	0.01
B-Co	1.91 ±	18.88 ±	18.88 ±	49.27 ±	6085.93 ±	55.21 ±	3.18 ±	0.35 ±	0.08 ±	3.42 ±	0.35 ±	0.01 ±
	0.08	0.13	0.13	0.21	21.23	0.98	0.19	0.09	0.01	0.11	0.07	0.01
C-Ba	3.12 ±	19.69 ±	19.69 ±	48.11 ±	5844.01 ±	50.88 ±	2.08 ±	0.20 ±	0.14 ±	2.68 ±	0.21 ±	0.01 ±
	0.03	0.14	0.12	0.19	14.44	1.21	0.04	0.01	0.05	0.15	0.05	0.01
C-Co	2.75 ±	19.88 ±	19.88 ±	49.25 ±	5904.05 ±	51.12 ±	2.00 ±	0.23 ±	0.15 ±	2.70 ±	0.19 ±	0.01 ±
	0.02	0.11	0.11	0.15	24.23	1.01	0.01	0.02	0.03	0.09	0.04	0.01

2 Notes: M moisture, A (A_{ar}) ash, V volatile matter, FC fixed carbon, _{ar} as received. A₁ means bypass system was not used. A₂ means bypass system was used. Ba means the baseline test. Co
3 means the co-processing test

Table S3 Combustible gas composition for plant C

Parameter	Value
Standard dry base gas flow rate (m ³ /h)	22700 ±0.44
T (°C)	566 ±0.22
O ₂ (%)	10.2 ±0.11
H ₂ O (%)	8.0 ±0.02
CO (%)	1.4 ±0.44
CO ₂ (%)	8.6 ±0.05
H ₂ + CH ₄ + N ₂ (%)	71.8 ±0.21

Table S4 Stench emission indices after the pre-treatment

Parameter	Plant A	Plant B	limit
PM (mg/m ³)	0.60 ±0.11	5.10 ±0.12	30.00 ±0.22
CO (mg/m ³)	3.00 ±0.14	4.00 ±0.15	–
CO ₂ (%)	3.79 ±0.13	1.83 ±0.09	–
TH (mg/m ³)	204.01 ±0.11	5.93 ±0.21	–
H ₂ S (g/h)	0.46 ±0.03	1.50 ±0.09	580 ±0.2
ME (g/h)	0.04 ±0.01	4.10 ±0.12	80.00 ±0.13
DMS (g/h)	3.60 ±0.14	5.10 ±0.12	580 ±9.45
DMDS (g/h)	1.10 ±0.09	8.00 ±0.11	770 ±0.98
CS ₂ (g/h)	0.50 ±0.01	0.06 ±0.01	2.70×10 ³
NH ₃ (g/h)	11.0 ±0.22	16.6 ±0.23	8.70×10 ³
TMA (g/h)	ND	0.05 ±0.01	970 .00±0.11
Styrene (g/h)	0.10 ±0.01	0.50 ±0.01	1.20×10 ⁴

Notes: ND means not detected, “–” means no standard limits. PM particulate matter, TH total hydrocarbons (calculated from the carbon content), Me methanethiol, DMS dimethyl sulfide, DMDS dimethyl disulfide, TMA trimethylamine

Table S5 Heavy metals contents of the input and output streams (mg/h)

Project	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Se	Mo	Cd	Sb	Hg	Tl	Pb	
A ₁ -Ba-in	RM	0.14 ±	48.08 ±	53.58 ±	523.41 ±	3.18 ±	9.91 ±	33.86 ±	147.31 ±	1.46 ±	7.14 ±	0.74 ±	29.64 ±	2.30 ±	0.34 ±	22.22 ±
		0.03	0.91	1.01	8.11	0.11	0.07	2.11	5.11	0.21	0.13	0.01	0.61	0.05	0.91	0.03
put	Coal	1.07 ±	23.25 ±	47.66 ±	124.81 ±	4.62 ±	15.50 ±	12.12 ±	36.46 ±	1.06 ±	1.20 ±	0.64 ±	83.12 ±	0.39 ±	0.01 ±	20.19 ±
		0.18	0.11	1.14	5.41	0.01	0.51	0.11	0.41	0.15	0.01	0.21	3.11	0.09	0.01	0.11
A ₁ -Ba-o	Flue gas	ND	0.03 ±	0.34 ±	0.17 ±	0.17 ±	0.03 ±	0.17 ±	0.58 ±	0.30 ±	0.34 ±	ND	0.07 ±	2.10 ±	0.04 ±	0.05 ±
			0.01	0.03	0.04	0.02	0.01	0.03	0.05	0.02	0.05		0.01	0.04	0.01	0.02
output	CKD	0.216	41.37 ±	43.44 ±	86.81 ±	3.56 ±	15.42 ±	41.41 ±	208.64 ±	1.70 ±	6.46 ±	0.64 ±	86.16 ±	4.60 ±	2.15 ±	37.04 ±
		±0.01	0.04	0.21	0.91	0.06	1.01	3.01	5.01	0.01	1.01	0.05	7.05	0.04	0.04	0.41
A ₁ -Co-in	CK	0.10 ±	76.16 ±	71.04 ±	833.00 ±	5.15 ±	15.29 ±	49.92 ±	364.40 ±	1.19 ±	10.46 ±	0.83 ±	59.26 ±	0.04 ±	ND	32.43 ±
		0.01	6.01	7.02	9.01	0.87	1.05	2.04	9.01	0.03	0.01	0.07	1.15	0.01		1.03
A ₁ -Co-in	RM	0.19 ±	55.94 ±	55.34 ±	567.00 ±	3.28 ±	11.15 ±	35.01 ±	136.50 ±	1.72 ±	6.23 ±	0.62 ±	79.92 ±	1.18 ±	0.34 ±	25.26 ±
		0.02	1.97	6.02	8.35	0.09	0.61	0.95	8.07	0.08	0.07	0.04	4.01	0.08	0.01	1.02
put	Coal	1.07 ±	23.96 ±	46.50 ±	275.50 ±	4.94 ±	17.29 ±	11.39 ±	40.34 ±	0.92 ±	1.19 ±	0.76 ±	81.78 ±	0.76 ±	0.01 ±	16.84 ±
		0.11	0.32	1.07	9.03	0.09	0.48	0.07	1.01	0.04	0.07	0.01	4.01	0.07	0.01	0.04
A ₁ -Co-o	RDF	0.18 ±	11.59 ±	217.20	143.60 ±	2.28 ±	20.04 ±	44.94 ±	226.30 ±	0.77 ±	2.46 ±	1.18 ±	45.40 ±	0.30 ±	ND	74.47 ±
		0.03	0.21	±0.07	4.01	0.05	0.05	1.01	8.07	0.02	0.07	0.04	1.01	0.02		6.01
output	Flue gas	ND	0.03 ±	0.34 ±	0.17 ±	0.17 ±	0.03 ±	0.17 ±	0.36 ±	0.50 ±	0.34 ±	0.01 ±	0.07 ±	2.10 ±	0.04 ±	0.02 ±
			0.01	0.02	0.01	0.04	0.01	0.05	0.02	0.04	0.03	0.01	0.01	0.04	0.02	0.01

	CKD	0.16 ± 0.01	39.38 ± 0.07	43.14 ± 0.98	405.30 ± 0.32	3.35 ± 0.05	11.29 ± 0.42	37.71 ± 0.07	259.90 ± 0.78	1.58 ± 0.07	4.98 ± 0.04	0.64 ± 0.09	82.76 ± 5.01	3.77 ± 0.09	1.88 ± 0.07	30.22 ± 0.41
	CK	0.11 ± 0.01	82.46 ± 0.45	79.48 ± 0.98	904.20 ± 9.01	5.62 ± 0.07	16.53 ± 0.32	64.74 ± 0.48	239.80 ± 0.99	1.08 ± 0.01	10.52 ± 0.07	0.85 ± 0.07	100.50 ±0.09	0.04 ± 0.01	0.01 ± 0.01	44.63 ± 0.09
	RM	0.70±0 .01	40.60± 4.07	90.04±6 .01	1058.70± 20.03	5.70±0. 08	30.40±0 .09	23.60±0 .11	384.20±1 .01	25.10±9 .01	4.71±0. 08	1.91±0. 07	2.20±0. 05	2.00±0. 11	216.10± 9.01	325.7±8. 04
A ₂ -Co-in put	Coal	1.81±0 .01	19.81± 0.08	292.24± 7.01	104.91±4. 07	5.51±0. 05	126.11± 0.04	0826.14 ±0.	45.51±0. 04	3.50±0. 05	0.41±0. 04	8.42±0. 08	0.31±0. 04	ND	2.80±0. 08	21.21±0. 04
	RDF	0.52±0 .05	17.71± 0.07	756.91± 9.01	387.91±8. 07	12.51± 1.01	341.01± 8.01	90.21±8 .01	384.12±9 .01	3.91±4. 01	8.61±0. 04	1.61±0. 04	3.40±0. 07	0.40±0. 05	ND	72.60±5. 01
	Flue gas	ND	0.02±0. 01	0.15±0. 04	0.23±0.03	ND	0.05±0. 03	0.10±0. 02	0.45±0.0 4	0.10±0. 03	0.01±0. 01	ND	0.01±0. 01	150.50± 5.04	0.46±0. 04	0.34±0.0 1
	By- gas	ND	0.02±0. 01	1.08±0. 07	1.43±0.03	0.02±0. 01	0.42±0. 04	0.37±0. 03	0.45±0.0 4	0.10±0. 02	0.01±0. 01	0.09±0. 02	0.01±0. 01	2.76±0. 04	0.01±0. 01	6.41±0.0 4
A ₂ -Co-o utput	CKD	1.00±0 .01	44.05± 0.32	64.00±0 .45	870.45±1 0.01	7.00±0. 08	26.21±0 .07	33.61±0 .08	456.85±6 .01	34.15±4 .09	5.12±0. 07	6.25±0. 35	7.85±0. 45	3.31±0. 09	7.45±0. 07	1755.11± 8.01
	B-C KD	0.80±0 .04	39.35± 0.05	80.15±0 .45	926.55±0. 33	5.90±0. 22	22.55±0 .11	105.10± 5.01	526.95±5 .02	34.80±4 .01	13.81±0 .32	88.55± 0.48	16.91±0 .90	4.01±0. 04	ND	64.75±8. 01
	CK	1.3±0. 01	59.01± 0.89	223.91± 5.45	1551.61± 8.54	9.11±0. 33	69.51±0 .67	76.61±0 .32	529.61±0 .55	35.71±0 .47	12.91±0 .35	7.21±0. 07	4.91±0. 08	ND	0.61±0. 05	451.31±0 .08
B-Ba-inp	RM	0.18±0	23.50±	36.40±0	45.21±9.1	5.58±0.	18.24±0	22.90±0	66.55±0.	1.12±0.	1.98±0.	0.40±0.	1.27±0.	0.44±0.	0.27±0.	13.07±0.

ut		.09	0.22	.42	2	15	.82	.92	42	02	02	02	10	02	01	42
	Coal	0.14±0.08	26.25±0.15	10.08±0.12	66.53±6.4	2.82±0.22	7.63±0.19	10.35±0.42	7.03±0.5	4.02±0.15	3.33±0.02	0.45±0.32	0.30±0.03	0.47±0.02	ND	15.20±1.12
	Flue gas	ND	0.04±0.01	0.50±0.13	2.05±0.12	0.18±0.10	0.03±0.01	0.18±0.02	8.00±0.5	0.19±0.03	0.26±0.01	ND	0.07±0.01	18.35±0.12	0.04±0.12	0.28±0.12
B-Ba-out	CKD	0.18±0.07	24.10±0.12	31.01±0.12	354.23±0.12	5.25±0.12	12.58±0.12	24.25±0.12	131.01±0.12	1.01±0.07	1.62±0.12	0.34±0.12	1.89±0.12	1.57±0.12	0.73±0.12	12.24±0.12
	CK	0.12±0.02	32.4±0.25	44.65±0.15	550.65±9.12	7.11±0.132	19.46±2.12	36.25±0.12	60.81±0.52	1.52±0.06	2.62±0.07	0.67±0.02	2.37±0.01	0.11±0.04	ND	19.82±0.15
	RM	0.16±0.05	23.42±0.45	36.01±0.42	437.2±8.12	6.06±1.12	8.58±0.42	24.01±0.32	51.72±0.32	1.00±0.10	1.58±0.02	1.32±0.04	1.47±0.04	0.46±0.02	0.34±0.03	13.00±0.14
B-Co-inp	IM	0.23±0.10	16.1±0.44	253.33±0.12	177.01±9.12	3.03±0.02	13.94±0.42	43.28±0.42	208.61±5.42	0.97±0.07	2.05±0.42	1.12±0.19	54.32±0.42	0.45±0.12	ND	89.97±1.12
ut	Coal	0.13±0.03	27.1±0.09	10.00±0.32	106.51±5.12	2.76±0.09	6.91±0.02	19.94±0.42	26.91±0.12	4.11±0.12	4.36±0.17	1.28±0.09	0.51±0.08	0.10±0.01	ND	17.20±0.18
	RDF	0.18±0.04	11.61±0.09	217.08±8.21	144.07±6.12	2.28±0.12	20.04±4.01	44.94±0.32	226.35±9.42	0.77±0.03	2.46±0.12	1.18±0.22	45.40±0.32	0.30±0.19	ND	74.47±0.45
	Flue gas	ND	0.04±0.12	0.35±0.01	1.08±0.21	0.18±0.01	0.03±0.01	0.43±0.02	0.26±0.04	0.41±0.05	0.35±0.01	0.19±0.04	0.07±0.01	13.62±0.04	0.04±0.01	0.07±0.02
B-Co-out	By-gas	ND	0.04±0.12	0.95±0.04	0.41±0.03	0.21±0.02	0.51±0.04	3.42±0.03	3.44±0.12	0.13±0.01	6.81±0.03	0.05±0.01	1.42±0.32	40.01±1.08	0.80±0.32	0.14±0.02

C-Ba-inp ut	CKD	0.15±0 .06	23.01± 0.09	19.62±1 .12	358.22±9 12	5.66±0 22	14.52±0 .62	30.61±0 .32	182.45±8 .12	1.13±0 05	1.59±0 12	0.47±0 02	3.05±0 22	1.86±0 02	1.11±0 01	14.4±0.0 2
	B-C KD	0.13±0 .07	28.22± 0.09	32.51±0 .13	335.33±9 12	5.11±0 08	9.92±0 08	39.51±0 .35	0.13±0.0 5	24.30±0 .25	9.12±0 09	11.01± 1.22	2.17±0 03	0.13±0 02	0.10±0 01	210.15±1 .98
	CK	0.14±0 .03	35.21± 0.09	41.92±0 .14	616.31±9 45	8.87±0 32	21.34±0 .52	60.41±0 .82	76.42±0 92	1.67±0 07	2.88±0 02	1.71±0 12	2.61±0 08	0.05±0 01	ND	24.3±0.1 2
	RM	0.30±0 .07	20.60± 0.47	50.71±0 .98	512.00±0 32	9.11±0 45	16.41±0 .33	81.94±0 .48	1423.11± 9.01	1.6±0.0 9	101.00± 0.91	8.31±0 45	306.98± 8.01	1.88±0 04	0.29±0 05	95.01±0 98
	Coal	0.32±0 .04	21.01± 0.08	22.21±1 .01	178.00±2 0.01	2.11±0 01	5.11±0 08	18.31±0 .32	713.02±0 .07	1.90±0 10	5.81±0 45	5.11±0 32	243.21± 0.32	1.42±0 31	0.10±0 01	34.51±0 05
	Flue gas	ND	0.04±0 01	0.49±0 03	2.12±0.04	0.20±0 02	0.05±0 05	0.63±0 04	8.20±0.1 4	ND	0.32±0 04	ND	0.08±0 05	16.00±0 .45	0.04±0 01	2.05±0.0 4
C-Ba-out put	CKD	0.36±0 .03	25.01± 0.08	50.51±1 .01	418.00±0 45	10.81± 0.91	18.41±5 .01	96.5±0 04	1677.12± 0.45	1.90±0 08	113.00± 0.51	12.81± 0.45	381.32± 8.01	4.24±0 07	4.20±0 08	128.12±0 .87
C-Co-inp ut	CK	0.18±0 .01	30.61± 0.65	76.21±0 .78	552.01±0 85	13.81± 0.91	24.51±0 .48	124.65± 0.98	1964.45± 8.45	1.60±0 05	159.45± 9.10	9.01±0 08	376.45± 0.87	0.60±0 07	ND	107.45±0 .87
	RM	0.30±0 .04	20.01± 0.05	34.34±0 .09	368.42±0 09	9.41±0 09	12.11±0 .08	85.6±0 85	1444.87± 5.07	1.20±0 01	94.31±0 .07	8.31±0 04	369.09± 0.87	1.30±0 01	0.30±0 04	82.31±0 81
	Coal	0.34±0 .09	19.81± 0.45	15.11±0 .45	162.42±0 98	2.41±0 32	6.21±0 09	17.41±0 .78	579.41±0 .98	1.80±0 05	5.08±0 09	4.72±0 01	182.32± 0.49	1.36±0 01	0.08±0 07	34.41±0 98
	MS	0.19±0	13.11±	229.01±	155.67±0	2.51±0	18.01±0	44.41±0	220.08±9	0.84±0	2.31±0	1.21±0	48.40±0	0.35±0	ND	79.61±0

	W	.04	0.01	0.04	45	61	.08	.32	.01	11	07	05	.07	03		07
	Flue gas	ND	0.04±0.05	0.43±0.04	2.31±0.04	0.22±0.03	0.03±0.02	0.80±0.07	7.00±5.01	0.28±0.01	0.43±0.03	0.01±0.01	0.09±0.02	15.32±0.07	0.05±0.04	2.08±0.07
	By-Flue	ND	0.04±0.07	4.01±0.04	3.32±0.05	0.20±0.04	1.32±0.07	3.21±0.09	13.00±0.09	0.01±0.01	3.01±0.05	0.49±0.07	0.08±0.01	3.00±0.21	0.05±0.01	7.31±0.21
C-Co-out put	CKD	0.26±0.01	25.21±4.52	36.31±0.58	416.32±0.78	10.81±0.98	14.42±0.98	90.81±0.87	1540.5±5.04	2.00±0.07	117.60±0.7	9.71±0.81	385.32±9.52	5.15±0.41	3.99±0.07	118.22±0.78
	By-CKD	0.19±0.04	23.11±0.38	44.51±0.98	947.45±9.58	11.71±0.81	16.41±0.05	148.45±0.98	1852.08±9.05	113.00±9.83	366.98±0.12	35.21±0.09	370.00±0.89	1.39±0.05	0.40±0.01	627.00±0.98
	CK	0.18±0.05	29.92±0.91	46.61±0.09	493.45±5.01	14.13±0.07	19.40±0.32	126.45±0.45	1697.20±5.01	1.10±0.07	132.45±0.54	8.21±0.08	355.09±0.45	0.44±0.01	ND	87.40±0.08
	Gasifier-slag	0.27±0.05	38.71±0.98	377.45±0.06	870.00±0.89	11.11±0.5	205.45±0.09	486.45±9.85	1403.08±9.01	1.92±0.03	11.20±0.51	19.91±0.11	382.08±0.45	0.49±0.07	0.02±0.01	175.57±0.45

Notes: ND not detected. A₁ means bypass system was not used. A₂ means bypass system was used. Ba means the baseline test. Co means the co-processing test

For convenience, the HM mass flow during CK production was divided into an input flow stream and an output flow stream. The flow rates and types of material were determined by the CK production process. In Table S5, it can be seen that the plant A input flow stream included RM, coal, and RDF and the output flow stream included flue gas, By-gas, CKD, By-CKD, and CK. The plant B input flow stream was the same as for plant A but with the addition of IC. The plant C input flow stream included RM, coal, and MSW and the output flow stream included flue gases, By-gas, CKD, By-CKD, CK, and gasifier slag.

Table S6 Heavy metals concentrations in cement products (mg/L)

Metal	A ₁ -Ba	A ₁ -Co	A ₂ -C _O	B-Ba	B-Co	C-Ba	C-Co	Limit
As	ND	ND	ND	ND	ND	ND	ND	0.1
Pb	ND	0.01	0.119	0.01	0.09	0.02	0.01	0.3
Cd	ND	ND	ND	ND	ND	ND	ND	0.03
Cr	0.04	0.02	0.05	0.01	0.01	0.02	0.02	0.2
Cu	0.20	0.17	0.08	0.07	0.04	0.06	0.15	1.0
Ni	0.01	0.04	0.02	0.15	0.1	0.14	0.16	0.2
Zn	0.38	0.34	0.55	0.59	0.09	0.12	0.80	1.0
Mn	0.53	0.84	0.95	0.59	0.49	0.54	0.53	1.0

Notes: ND not detected. A₁ means bypass system was not used. A₂ means bypass system was used. Ba means the baseline test. Co means the co-processing test

Table S7 Raw meal (RM) and clinker (CK) parameter

Project	RM							CK											
	LoI (%)	SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	CaO (%)	MgO (%)	Cl ⁻ (%)	LoI (%)	SiO ₂ (%)	Al ₂ O ₃ (%)	Fe ₂ O ₃ (%)	CaO (%)	MgO (%)	SO ₃ (%)	Cl ⁻ (%)	Flexural strength for 3 days	Compressive strength for 3 days	Flexural strength for 28 days	Compressive strength for 28 days
A ₁ -Ba	36.84	12.23	2.63	2.16	41.93	3.29	0.02	0.11	21.72	4.67	3.35	63.14	4.79	0.83	0.01	5.9	31.6	9.1	58.8
A ₁ -Co	36.83	12.08	2.58	2.13	42.12	3.37	0.03	0.16	21.26	4.52	3.37	63.16	4.97	0.82	0.01	5.8	30.5	9	58.4
A ₂ -Co	34.54	13.52	3.05	2.09	43.27	0.52	0.03	0.26	21.46	5.12	3.29	66.14	1.09	0.76	0.03	5.7	32.1	8.5	56
B-Ba	35.47	13.57	3.24	1.97	43.35	1.04	0.08	0.38	22.1	5.37	3.11	65.82	1.75	0.53	0.07	6.2	32.4	8.3	56.9
B-Co	35.83	13.25	3.27	2.05	43.05	1.42	0.12	0.46	21.99	5.41	3.35	65.06	2.18	0.63	0.08	5.7	31.4	8	56.1
C-Ba	34.82	13.26	2.87	2.42	44.68	0.61	0.08	0.22	21.92	4.84	3.85	66.49	1.36	0.44	0.03	5.3	31.8	8.1	57.9
C-Co	33.85	13.68	2.87	2.46	44.61	0.58	0.1	0.23	21.9	4.84	4.08	66.52	1.18	0.52	0.05	6.2	32.6	8.7	58.3
limit	-	-	-	-	-	-	-	≤ 1.5	-	-	-	-	≤5.0	≤ 1.5	-	-	≥26	-	≥52.5

Notes: “-” means no standard limits. A₁ means bypass system was not used. A₂ means bypass system was used. Ba means the baseline test. Co means the co-processing test

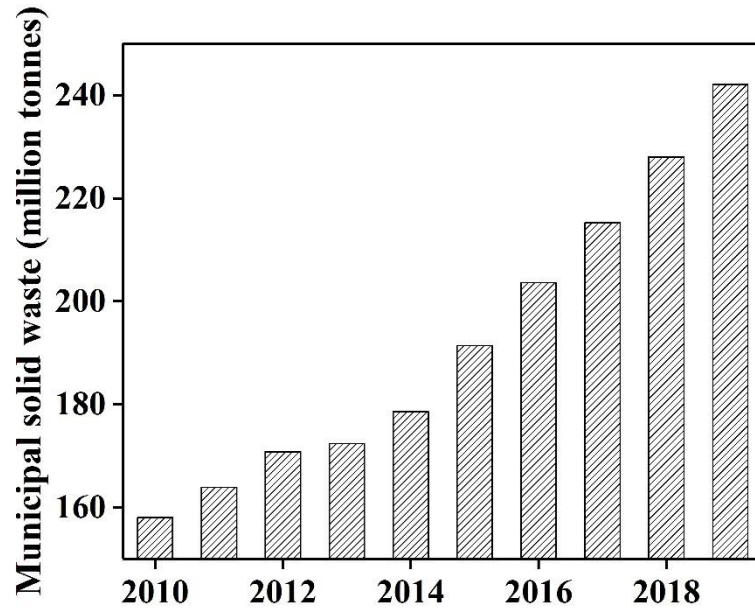


Fig. S1 Amounts of municipal solid waste produced in China from 2010 to 2019 (Data were released by National Bureau of Statistics of China in 2019)

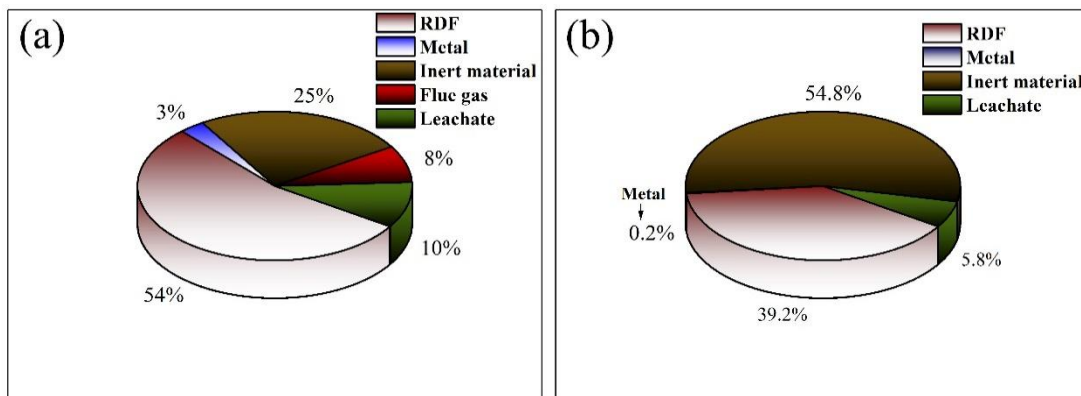


Fig. S2 Percentage contributions of various components to (a) fermentation and (b) screening products (RDF refuse derived fuel)