

Table S1. Cumulative Methane Production of Pretreatment Methods Employed in the Study

Pretreatment methods	Cumulative methane production (mL/g VS)
Microwave (700 W, 6 min)	329
Ultrasonic wave (20 + 30 kHz, 60 min)	323
Heat treatment (110°C, 60 min)	187

Table S2. Optimum Pretreatment Method of Sewage Sludge and Methane Production

Treatment methods and conditions		Anaerobic digestion conditions	Methane production	Reference
Microwave	650 W	37°C	Increase of methane production from 147 to 208 mL/g-VS	[1]
	720 W	37°C	Increase of methane production from 144 to 220 mL/g-VS	
Ultrasonic wave	21 kHz	37°C	Increase of methane production from 146 to 159 mL/g-VS.	[2]
	20 kHz	35°C	Increase of Methane production from 143 to 292 mL/g-VS	[3]
Heat treatment	110°C, 60 min	36°C	Increase of methane production from 350 to 420 mL/g-VS	[4]
	115°C, 60 min	35°C	Increase of methane production from 115 to 186 mL/g-VS	[5]

Table S3. Simplex Centroid Design for Three-substrate Batch Co-digestion Runs

Run	Mix composition (% of substrate volume)		
	Sewage sludge	Food waste	Livestock manure
1	-	50.0	50.0
2	66.6	16.6	16.7
3	-	100.0	-
4	-	-	100.0
5	100.0	-	-
6	33.3	33.3	33.4
7	50.0	-	50.0
8	16.6	66.7	16.7
9	16.6	16.6	66.7
10	50.0	50.0	-

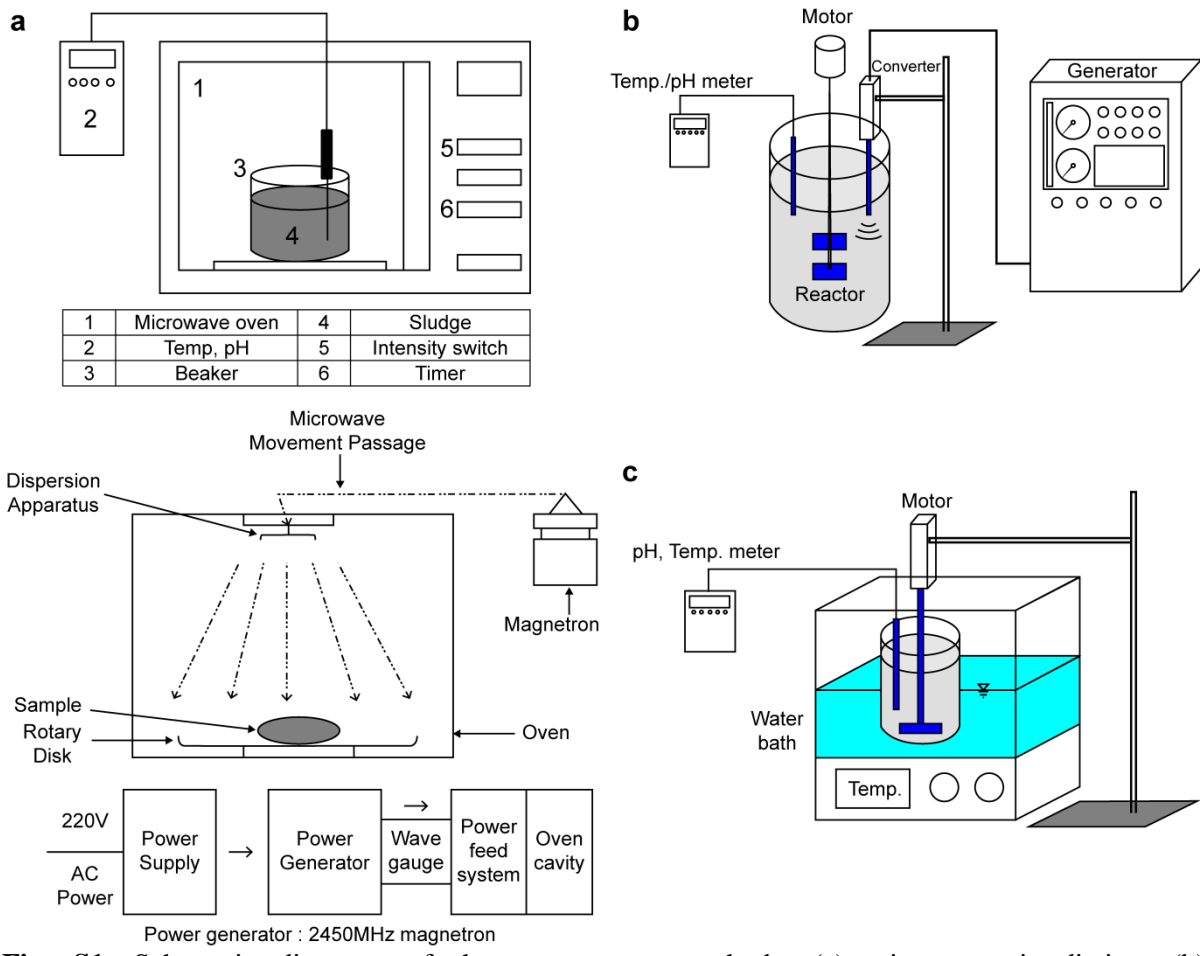


Fig. S1. Schematic diagrams of the pretreatment methods: (a) microwave irradiation, (b) ultrasonication, and (c) heat treatment.

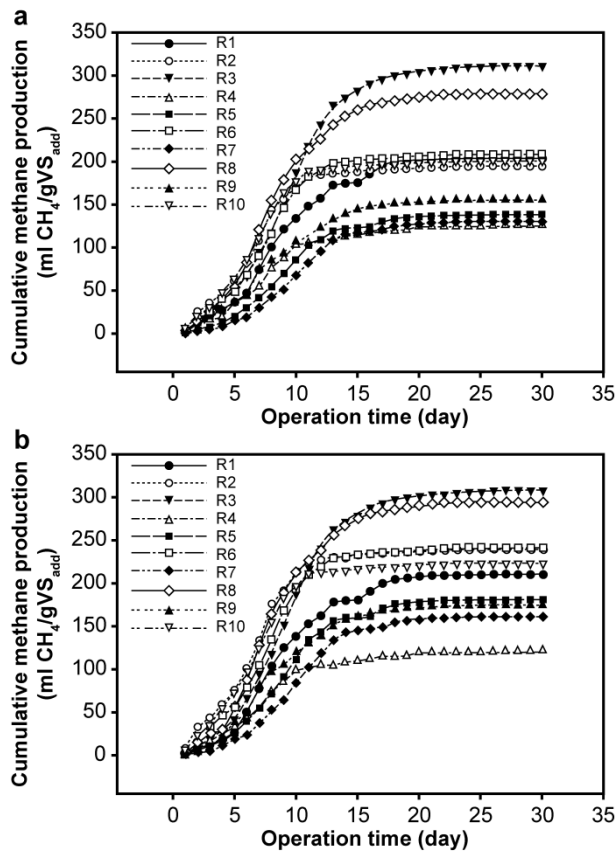


Fig. S2. Cumulative methane production: (a) before and (b) after sludge pretreatment.

References

1. Doğan I, Sanin FD. Alkaline solubilization and microwave irradiation as a combined sludge disintegration and minimization method. *Water Res.* 2009;43:2139-2148.
2. Tiehm A, Nickel K, Neis U. The use of ultrasound to accelerate the anaerobic digestion of sewage sludge. *Water Sci. Technol.* 1997;36:121-128.
3. Chu CP, Lee DJ, Chang BV, You CS, Tay JH. "Weak" ultrasonic pre-treatment on anaerobic digestion of flocculated activated biosolids. *Water Res.* 2002;36:2681-2688.
4. Barjenbruch M, Kopplow O. Enzymatic, mechanical and thermal pre-treatment of surplus sludge. *Adv. Environ. Res.* 2003;7:715-720.
5. Haug RT, Stuckey DC, Gossett JM, McCarty PL. Effect of thermal pretreatment on digestibility and dewaterability of organic sludges. *J. Water Pollut. Control Fed.* 1978;50:73-85.