

# Electronic Supplementary Material

## Effect of temperature and acid zeolites on gas yield and composition during pyrolysis of municipal sewage sludge

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**Table A1. Influence of MSS feedstock composition and pyrolysis parameters on H<sub>2</sub>S concentration in pyrogas.**

	Fonts et al. [11]	Jaramillo-Arango et al. [12]	This study	
<b>Carbon (wt %) <sup>c</sup></b>	23.1 – 28.5	12.79	36.0 <sup>a</sup>	
<b>Hydrogen (wt %) <sup>c</sup></b>	3.1 – 4.4	1.74	5.3 <sup>a</sup>	
<b>Nitrogen (wt %) <sup>c</sup></b>	3.2 – 4.1	1.20	5.8 <sup>a</sup>	
<b>Sulfur (wt %) <sup>c</sup></b>	0.8 – 0.9	0.55	1.1 <sup>a</sup>	
<b>Oxygen (wt %) <sup>c</sup></b>	17.7 – 22.4	16.22	22.2 <sup>a</sup>	
<b>Chlorine (wt %) <sup>c</sup></b>	n.r.	n.r.	0.1 <sup>a</sup>	
<b>MC (wt %)</b>	5.3 – 7.1	n.r.	2.4 <sup>a</sup>	
<b>AC (wt %) <sup>c</sup></b>	39.9 – 52.0	67.50	29.2 <sup>a</sup>	
<b>VM (wt %) <sup>c</sup></b>	38.3 – 47.0	29.01	57.8 <sup>a</sup>	
<b>FC (wt %) <sup>c</sup></b>	4.4 – 6.4	3.49	10.7 <sup>a</sup>	
<b>Pyrolysis temperature (°C)</b>	550	800	800	500
<b>SRT (min)</b>	n.r.	90	15	15
<b>H<sub>2</sub>S in pyrogas (% v/v)</b>	2 – 4 <sup>b</sup>	0.20	2.40	4.45

<sup>a</sup>: previously reported by Cedrone et al. [28]; <sup>b</sup>: deducted from graphics; wt: on a weight basis; <sup>c</sup>: on a dry basis; MSS: municipal sewage sludge; SRT: solid retention time; MC: moisture content; AC: ash content; VM: volatile matter; FC: fixed carbon; v/v: by volume; n.r.: not reported.

**Table A2. Characteristics of the zeolites.** The physical-chemical characteristics and the producers of the three different zeolites tested in the study.

<b>Zeolites</b>	<b>H-Mordenite</b>	<b>H-ZSM5</b>	<b>H-ZSM5</b>
<b>SAR <sup>a</sup></b>	220	250	1880
<b>BET surface area <sup>a</sup> (m<sup>2</sup>/g)</b>	450	> 400	310
<b>Pore size <sup>a</sup> (Å)</b>	7	5-6	5-6
<b>Particle size <sup>a</sup> (µm)</b>	12	10	10
<b>Sulfur content (wt % db)</b>	0.14	0.13	0.10
<b>Moisture content (wt %)</b>	7.7	1.6	2.9
<b>Producer</b>	<i>Tosoh, Japan</i>	<i>Tricat Zeolites, Germany</i>	<i>Tosoh, Japan</i>

<sup>a</sup> : data provided by the producer; SAR: SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> ratio; BET: Brunauer-Emmett Teller; wt: on a weight basis.