

**Table B.1.: Selection of (putative) substrates, catabolic reactions and available standard energies changes related to methanogenesis and organized by catabolic pathways and more favorable energetic changes in standard conditions.** Standard Gibbs free energies are expressed for 298.15 K, 1 atm, pH 7 and 1 M of each chemical species (albeit proton), thus some reactions have been adapted from literature to meet these criteria. Reactions involving sulfide are expressed for  $\text{HS}_{(\text{aq})}^-$  remembering that  $\text{HS}_{(\text{aq})}^- \leftrightarrow \text{H}_2\text{S}_{(\text{aq})}$  equilibrium is very close to neutral pH ( $\text{pK}_a = 6.97\text{--}7.05$ , [1,2]). The ‘3,5-dimethoxy-4-acetyl-phenol’ mentioned by Mayumi et al. [3] could not have been identified in the literature or on the online PubChem chemistry database (<https://pubchem.ncbi.nlm.nih.gov/>). To avoid confusion, electron donor ( $\text{H}^+$  or formate) involved in a methyl-dependent hydrogenotrophic reaction is mentioned after the electron acceptor.  $\text{CO}_2$ , proton and methane are in their aqueous form while water is in liquid phase. aq., aqueous; F., formate; G., genomic potential; M.: mixed approaches; nd: not determined; P.: physiological conditions, <sup>i</sup>: intermediate catabolic reaction; \*: equation deduced from the publication; \*\*: hypothesized by the authors.

Substrate	Main methane co-product	Methanogenic reaction	$\Delta G^0$ (kJ mol <sup>-1</sup> )	$\Delta G^0$ (kJ mol <sup>-1</sup> CH <sub>4</sub> )	Evidence	Reference for evidence of methanogenesis
<b>METHYL-REDUCING HYDROGENOTROPHIC/ METHYL-REDUCING FORMATOTROPHIC</b>						
Trimethylamine (aq) + H <sub>2</sub> (aq) <sup>i</sup>	Dimethylamine (aq)	$(\text{CH}_3)_3\text{NH}^+ + \text{H}_2 \rightarrow \text{CH}_4 + (\text{CH}_3)_2\text{NH}_2^+$	-92.5	-92.5	P., *	[4]
Dimethylamine (aq) + H <sub>2</sub> (aq) <sup>i</sup>	Methylamine (aq)	$(\text{CH}_3)_2\text{NH}_2^+ + \text{H}_2 \rightarrow \text{CH}_4 + \text{CH}_3\text{NH}_3^+$	-88.6	-88.6	P., *	[4]
Trimethylamine (aq) + F. (aq) <sup>i</sup>	Dimethylamine (aq), CO <sub>2</sub> (aq)	$(\text{CH}_3)_3\text{NH}^+ + \text{HCO}_2^- + \text{H}^+ \rightarrow \text{CH}_4 + \text{CO}_2 + (\text{CH}_3)_2\text{NH}_2^+$	-69.9	-69.9	P., *	[5]
Dimethylamine (aq) + F. (aq) <sup>i</sup>	Methylamine (aq), CO <sub>2</sub> (aq)	$(\text{CH}_3)_2\text{NH}_2^+ + \text{HCO}_2^- + \text{H}^+ \rightarrow \text{CH}_4 + \text{CO}_2 + \text{CH}_3\text{NH}_3^+$	-66.1	-66.1	P., *	[5]
Tetramethylammonium (aq) + H <sub>2</sub> (aq) <sup>i</sup>	Trimethylamine (aq)	$(\text{CH}_3)_4\text{N}^+ + \text{H}_2 \rightarrow \text{CH}_4 + (\text{CH}_3)_3\text{NH}^+$	-210.6	-210.6	P., *	[6]
Tetramethylammonium (aq) + F. (aq) <sup>i</sup>	Trimethylamine (aq), CO <sub>2</sub> (aq)	$(\text{CH}_3)_4\text{N}^+ + \text{HCO}_2^- + \text{H}^+ \rightarrow \text{CH}_4 + \text{CO}_2 + (\text{CH}_3)_3\text{NH}^+$	-188.1	-188.1	P., *	[6]
Dimethylsulfide (aq) + H <sub>2</sub> (aq) <sup>i</sup>	Methanethiol (aq)	$(\text{CH}_3)_2\text{S} + \text{H}_2 \rightarrow \text{CH}_4 + \text{CH}_3\text{SH}$	-67.7	-67.7	P., *	[7]
Dimethylsulfide (aq) + F. (aq) <sup>i</sup>	Methanethiol (aq), CO <sub>2</sub> (aq)	$(\text{CH}_3)_2\text{S} + \text{HCO}_2^- + \text{H}^+ \rightarrow \text{CH}_4 + \text{CO}_2 + \text{CH}_3\text{SH}$	-45.2	-45.2	P., *	[7]
<b>METHYL-DISMUTATING</b>						
Tetramethylammonium (aq) <sup>i</sup>	Trimethylamine (aq), CO <sub>2</sub> (aq)	$4(\text{CH}_3)_4\text{N}^+ + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4(\text{CH}_3)_3\text{NH}^+$	-649.3	-216.4	P.	[8]
Dimethylsulfide (aq) <sup>i</sup>	Methanethiol (aq), CO <sub>2</sub> (aq)	$4(\text{CH}_3)_2\text{S} + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{CH}_3\text{SH}$	-77.7	-25.9	P., *	[9]
Trimethylamine (aq) <sup>i</sup>	Dimethylamine (aq), CO <sub>2</sub> (aq)	$4(\text{CH}_3)_3\text{NH}^+ + 2\text{H}_2\text{O} \rightarrow \text{CH}_4 + \text{CO}_2 + 4(\text{CH}_3)_2\text{NH}_2^+$	-176.8	-58.9	P., *	[10]
Dimethylamine (aq) <sup>i</sup>	Methylamine (aq), CO <sub>2</sub> (aq)	$4(\text{CH}_3)_2\text{NH}_2^+ + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{CH}_3\text{NH}_3^+$	-161.6	-53.9	P., *	[10]
Dimethylethylamine (aq)	Methylethylamine (aq), CO <sub>2</sub> (aq)	$2(\text{CH}_3)_2\text{NCH}_2\text{CH}_3 + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 2\text{H}_2\text{NCH}_2\text{CH}_3$	nd	nd	P.	[11]
Dimethylethylamine (aq) <sup>i</sup>	Methylethylamine (aq), CO <sub>2</sub> (aq)	$4(\text{CH}_3)_2\text{NCH}_2\text{CH}_3 + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{CH}_3\text{NHCH}_2\text{CH}_3$	nd	nd	P., *	[11]
Methylethylamine (aq)	Ethylamine (aq), CO <sub>2</sub> (aq)	$4\text{CH}_3\text{NHCH}_2\text{CH}_3 + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{H}_2\text{NCH}_2\text{CH}_3$	nd	nd	P., *	[11]
5-methylfurfural (aq)	Furfural (aq), CO <sub>2</sub> (aq)	$4\text{C}_4\text{H}_2\text{OCHOCH}_3 + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{C}_4\text{H}_3\text{OCHO}$	nd	nd	P., *	[12]
2-methylfurfural (aq)	Furfural (aq), CO <sub>2</sub> (aq)	$4\text{C}_4\text{H}_2\text{OCHOCH}_3 + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{C}_4\text{H}_3\text{OCHO}$	nd	nd	P., *	[12]
<b>METHOXYL-DISMUTATING</b>						
2-methoxybenzoate (aq)	2-hydroxybenzoate (aq), CO <sub>2</sub> (aq)	$4\text{C}_6\text{H}_5(\text{OCH}_3)\text{CO}_2^- + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{C}_6\text{H}_5\text{OHCO}_2^-$	nd	nd	P., *	[3]
3-methoxybenzoate (aq)	3-hydroxybenzoate (aq), CO <sub>2</sub> (aq)	$4\text{C}_6\text{H}_5(\text{OCH}_3)\text{CO}_2^- + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 4\text{C}_6\text{H}_5\text{OHCO}_2^-$	nd	nd	P., *	[3]
3,5-dimethoxybenzoate (aq ?)	3,5-dihydroxybenzoate (aq), CO <sub>2</sub> (aq)	$2\text{C}_6\text{H}_5(\text{OCH}_3)_2\text{CO}_2^- + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 2\text{C}_6\text{H}_5(\text{OH})_2\text{CO}_2^-$	nd	nd	P., *	[3]
3,5-dimethoxy-4-hydroxybenzoate (aq)	3,5-dihydroxy-4-hydroxybenzoate (aq), CO <sub>2</sub> (aq)	$2\text{C}_6\text{H}_5(\text{OH})(\text{OCH}_3)_2\text{CO}_2^- + 2\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + \text{CO}_2 + 2\text{C}_6\text{H}_5(\text{OH})_3\text{CO}_2^-$	nd	nd	P., *	[3]
2,3,4-trimethoxybenzoate (aq)	2,3,4-trihydroxybenzoate (aq), CO <sub>2</sub> (aq)	$4\text{C}_6\text{H}_5(\text{OCH}_3)_3\text{CO}_2^- + 6\text{H}_2\text{O} \rightarrow 9\text{CH}_4 + 3\text{CO}_2 + 4\text{C}_6\text{H}_5(\text{OH})_3\text{CO}_2^-$	nd	nd	P., *	[3]

2,4,5-trimethoxybenzoate (aq)	2,3,4-trihydroxybenzoate (aq), CO <sub>2</sub> (aq)	$4C_6H_5(OCH_3)_3CO_2^- + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_5(OH)_3CO_2^-$	nd	nd	P., *	[3]
2-methoxycinnamate (aq ?)	2-hydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4OH(CH)_2CO_2^-$	nd	nd	P., *	[3]
3-methoxycinnamate (aq ?)	3-hydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4OH(CH)_2CO_2^-$	nd	nd	P., *	[3]
4-methoxycinnamate (aq ?)	4-hydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4OH(CH)_2CO_2^-$	nd	nd	P., *	[3]
3-methoxy-4-hydroxycinnamate (aq ?)	3,4-dihydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$4C_6H_3(OH)(OCH_3)(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_3(OH)_2(CH)_2CO_2^-$	nd	nd	P., *	[3]
2,3-methoxycinnamate (aq ?)	2,3-dihydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$2C_6H_3(OCH_3)_2(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 2C_6H_3(OH)_2(CH)_2CO_2^-$	nd	nd	P., *	[3]
3,4-methoxycinnamate (aq ?)	3,4-dihydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$2C_6H_3(OCH_3)_2(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 2C_6H_3(OH)_2(CH)_2CO_2^-$	nd	nd	P., *	[3]
2,5-methoxycinnamate (aq ?)	2,5-dihydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$2C_6H_3(OCH_3)_2(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 2C_6H_3(OH)_2(CH)_2CO_2^-$	nd	nd	P., *	[3]
3,4,5-trimethoxycinnamate (aq?)	3,4,5-trihydroxycinnamate (aq?), CO <sub>2</sub> (aq)	$4C_6H_2(OCH_3)_3(CH)_2CO_2^- + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_2(OH)_3(CH)_2CO_2^-$	nd	nd	P., *	[3]
3,5-methoxy-4-hydroxycinnamate (aq ?)	3,4,5-trihydroxycinnamate (aq ?), CO <sub>2</sub> (aq)	$2C_6H_2(OH)(OCH_3)_2(CH)_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 2C_6H_2(OH)_3(CH)_2CO_2^-$	nd	nd	P., *	[3]
3-methoxy-phenol (aq)	3-hydroxyphenol (aq), CO <sub>2</sub> (aq)	$4C_6H_4(OH)(OCH_3) + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4(OH)_2$	nd	nd	P., *	[3]
3,5-dimethoxy-4-acetyl-phenol	nd	nd	nd	nd	P., *	[3]
3,4,5-trimethoxy-phenol	3,4,5-trihydroxyphenol, CO <sub>2</sub> (aq)	$4C_6H_2(OCH_3)_3OH + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_2(OH)_4$	nd	nd	P., *	[3]
1,2,3-trimethoxy-benzene	1,2,3-trihydroxybenzene, CO <sub>2</sub> (aq)	$4C_6H_3(OCH_3)_3 + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_3(OH)_3$	nd	nd	P., *	[3]
1,2,4-trimethoxy-benzene	1,2,4-trihydroxybenzene, CO <sub>2</sub> (aq)	$4C_6H_3(OCH_3)_3 + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_3(OH)_3$	nd	nd	P., *	[3]
1,3,5-trimethoxy-benzene	1,3,5-trihydroxybenzene, CO <sub>2</sub> (aq)	$4C_6H_3(OCH_3)_3 + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_3(OH)_3$	nd	nd	P., *	[3]
2-methoxy-phenyl-acetate	2-hydroxyphenylacetate, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)CH_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4(OH)CH_2CO_2^-$	nd	nd	P., *	[3]
3-methoxy-phenyl-acetate	3-hydroxyphenylacetate, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)CH_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4(OH)CH_2CO_2^-$	nd	nd	P., *	[3]
4-methoxy-phenyl-acetate	4-hydroxyphenylacetate, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)CH_2CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4(OH)CH_2CO_2^-$	nd	nd	P., *	[3]
3,4,5-trimethoxy-phenyl-acetate	3,4,5-trihydroxyphenylacetate, CO <sub>2</sub> (aq)	$4C_6H_2(OCH_3)_3CH_2CO_2^- + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_2(OH)_3CH_2CO_2^-$	nd	nd	P., *	[3]
3-methoxy-4-hydroxybenzaldehyde	3,4-dihydroxybenzaldehyde, CO <sub>2</sub> (aq)	$4C_6H_4(OH)OCH_3COH + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4(OH)_2COH$	nd	nd	P., *	[3]
3,5-dimethoxy-4-hydroxy-benzaldehyde	3,4,5-trihydroxy-benzaldehyde, CO <sub>2</sub> (aq)	$2C_6H_2OH(OCH_3)_2COH + 2H_2O \rightarrow 3CH_4 + CO_2 + 2C_6H_2(OH)_3COH$	nd	nd	P., *	[3]
3,4,5-trimethoxy-benzaldehyde	3,4,5-trihydroxy-benzaldehyde, CO <sub>2</sub> (aq)	$4C_6H_2(OCH_3)_3COH + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_2(OH)_3COH$	nd	nd	P., *	[3]
4-methoxy-benzyl-alcohol	4-hydroxy-benzyl-alcohol, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)CH_2OH + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_4OHCH_2OH$	nd	nd	P., *	[3]
3,4,5-trimethoxy-benzyl-chloride	3,4,5-trihydroxy-benzyl-chloride, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)_3CH_2Cl + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_4(OH)_3CH_2Cl$	nd	nd	P., *	[3]
3,4,5-trimethoxy-benzyl-alcohol	3,4,5-trihydroxy-benzyl-alcohol, CO <sub>2</sub> (aq)	$4C_6H_4(OCH_3)_3CH_2OH + 6H_2O \rightarrow 9CH_4 + 3CO_2 + 4C_6H_4(OH)_3CH_2OH$	nd	nd	P., *	[3]
2-methoxy-benzene-1,4,-diol	2-hydroxy-benzene-1,4,-diol, CO <sub>2</sub> (aq)	$4C_6H_3OH(OCH_3) + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_3(OH)_3$	nd	nd	P., *	[3]
3-methoxy-4-hydroxy-acetophenone	3,4-dihydroxy-acetophenone, CO <sub>2</sub> (aq)	$4C_6H_3OH(OCH_3) + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6H_3(OH)_3$	nd	nd	P., *	[3]
2-methoxy-3-pyridinecarboxylate	2-hydroxy-3-pyridinecarboxylate, CO <sub>2</sub> (aq)	$4C_6NH_3(OCH_3)CO_2^- + 2H_2O \rightarrow 3CH_4 + CO_2 + 4C_6NH_3OHCO_2^-$	nd	nd	P., *	[3]

ALKANOTROPHIC						
<i>n</i> -Propane (aq)	CO <sub>2</sub> (aq)	$2C_3H_8 + 2H_2O \rightarrow 5CH_4 + CO_2$	-66.4	-13.3	G, **	[13]
<i>n</i> -Butane (aq)	CO <sub>2</sub> (aq)	$4C_4H_{10} + 6H_2O \rightarrow 13CH_4 + 3CO_2$	-182.3	-14.0	G, **	[13]
<i>n</i> -Pentane (aq)	CO <sub>2</sub> (aq)	$C_5H_{12} + 2H_2O \rightarrow 4CH_4 + CO_2$	-58.0	-14.5	G, **	[14]
<i>n</i> -Hexane (l)	CO <sub>2</sub> (aq)	$4C_6H_{14} + 10H_2O \rightarrow 19CH_4 + 5CO_2$	-197.2	-10.4	G, **	[14]
<i>n</i> -Heptane (l)	CO <sub>2</sub> (aq)	$2C_7H_{16} + 6H_2O \rightarrow 11CH_4 + 3CO_2$	-116.5	-10.6	G, **	[14]
<i>n</i> -Octane (l)	CO <sub>2</sub> (aq)	$2C_8H_{18} + 14H_2O \rightarrow 25CH_4 + 7CO_2$	-269.0	-10.8	G, **	[14]
<i>n</i> -Nonane (l)	CO <sub>2</sub> (aq)	$C_9H_{20} + 4H_2O \rightarrow 7CH_4 + 2CO_2$	-76.2	-10.9	G, **	[14]
<i>n</i> -Decane (l)	CO <sub>2</sub> (aq)	$4C_{10}H_{22} + 18H_2O \rightarrow 31CH_4 + 9CO_2$	-340.7	-11.0	G, **	[14]
<i>n</i> -Undecane (l)	CO <sub>2</sub> (aq)	$2C_{11}H_{24} + 10H_2O \rightarrow 17CH_4 + 5CO_2$	-188.3	-11.1	G, **	[14]
<i>n</i> -Dodecane (l)	CO <sub>2</sub> (aq)	$4C_{12}H_{26} + 22H_2O \rightarrow 37CH_4 + 11CO_2$	-412.4	-11.1	G, **	[14]
<i>n</i> -Tridecane (l)	CO <sub>2</sub> (aq)	$C_{13}H_{28} + 6H_2O \rightarrow 10CH_4 + 3CO_2$	-112.1	-11.2	M., *	[15]
<i>n</i> -Tetradecane (l)	CO <sub>2</sub> (aq)	$4C_{14}H_{30} + 26H_2O \rightarrow 43CH_4 + 13CO_2$	-484.2	-11.3	M., *	[15]
<i>n</i> -Pentadecane (l)	CO <sub>2</sub> (aq)	$2C_{15}H_{32} + 14H_2O \rightarrow 23CH_4 + 7CO_2$	-260.0	-11.3	M., *	[15]
<i>n</i> -Heptadecane (l)	CO <sub>2</sub> (aq)	$C_{17}H_{36} + 8H_2O \rightarrow 13CH_4 + 4CO_2$	-148.0	-11.4	M., *	[15]
<i>n</i> -Octadecane (s)	CO <sub>2</sub> (aq)	$4C_{18}H_{38} + 34H_2O \rightarrow 55CH_4 + 17CO_2$	-641.4	-11.7	M., *	[15]
<i>n</i> -Nonadecane (s)	CO <sub>2</sub> (aq)	$2C_{19}H_{40} + 18H_2O \rightarrow 29CH_4 + 9CO_2$	-336.9	-11.6	M., *	[15]
<i>n</i> -Eicosane (s)	CO <sub>2</sub> (aq)	$4C_{20}H_{42} + 38H_2O \rightarrow 61CH_4 + 19CO_2$	-706.0	-11.6	M., *	[15]
<i>n</i> -Heneicosane (s)	CO <sub>2</sub> (aq)	$C_{21}H_{44} + 10H_2O \rightarrow 16CH_4 + 5CO_2$	-184.6	-11.5	M., *	[15]
<i>n</i> -Docosane (s)	CO <sub>2</sub> (aq)	$4C_{22}H_{46} + 42H_2O \rightarrow 67CH_4 + 21CO_2$	-770.7	-11.5	M., *	[15]
<i>n</i> -Tricosane (s)	CO <sub>2</sub> (aq)	$2C_{23}H_{48} + 22H_2O \rightarrow 35CH_4 + 11CO_2$	-401.5	-11.5	M., *	[15]
<i>n</i> -Tetracosane (s)	CO <sub>2</sub> (aq)	$4C_{24}H_{50} + 46H_2O \rightarrow 73CH_4 + 23CO_2$	-835.3	-11.4	M., *	[15]
<i>n</i> -Pentacosane (s)	CO <sub>2</sub> (aq)	$C_{25}H_{52} + 12H_2O \rightarrow 19CH_4 + 6CO_2$	-216.9	-11.4	M., *	[15]
<i>n</i> -Hexacosane (s)	CO <sub>2</sub> (aq)	$4C_{26}H_{54} + 50H_2O \rightarrow 79CH_4 + 25CO_2$	-900.0	-11.4	M., *	[15]
<i>n</i> -Heptacosane (s)	CO <sub>2</sub> (aq)	$2C_{27}H_{56} + 26H_2O \rightarrow 41CH_4 + 13CO_2$	-466.2	-11.4	M., *	[15]
<i>n</i> -Octacosane (s)	CO <sub>2</sub> (aq)	$4C_{28}H_{58} + 54H_2O \rightarrow 85CH_4 + 27CO_2$	-964.7	-11.3	M., *	[15]
<i>n</i> -Nonacosane (s)	CO <sub>2</sub> (aq)	$C_{29}H_{60} + 14H_2O \rightarrow 22CH_4 + 7CO_2$	-249.2	-11.3	M., *	[15]
<i>n</i> -Triacontane (s)	CO <sub>2</sub> (aq)	$4C_{30}H_{62} + 58H_2O \rightarrow 91CH_4 + 29CO_2$	-1029.3	-11.3	M., *	[15]
<i>n</i> -Hentriacontane (s)	CO <sub>2</sub> (aq)	$2C_{31}H_{64} + 30H_2O \rightarrow 47CH_4 + 15CO_2$	-530.8	-11.3	M., *	[15]

<i>n</i> -Dotriacontane (s)	CO <sub>2</sub> (aq)	$4C_{32}H_{66} + 62H_2O \rightarrow 97CH_4 + 31CO_2$	-1094.0	-11.3	M., *	[15]
<i>n</i> -Tritriacontane (s)	CO <sub>2</sub> (aq)	$C_{33}H_{68} + 16H_2O \rightarrow 25CH_4 + 8CO_2$	-281.6	-11.3	M., *	[15]
<i>n</i> -Tetraatriacontane (s)	CO <sub>2</sub> (aq)	$4C_{34}H_{70} + 66H_2O \rightarrow 103CH_4 + 33CO_2$	-1158.6	-11.2	M., *	[15]
<i>n</i> -Pentatriacontane (s)	CO <sub>2</sub> (aq)	$2C_{35}H_{72} + 34H_2O \rightarrow 53CH_4 + 17CO_2$	-585.5	-11.2	M., *	[15]
<i>n</i> -Hexatriacontane (s)	CO <sub>2</sub> (aq)	$4C_{36}H_{74} + 70H_2O \rightarrow 109CH_4 + 35CO_2$	-1223.3	-11.2	M., *	[15]
<i>n</i> -Heptatriacontane (s)	CO <sub>2</sub> (aq)	$C_{37}H_{76} + 18H_2O \rightarrow 28CH_4 + 9CO_2$	-313.9	-11.2	M., *	[15]
<i>n</i> -Octatriacontane (s)	CO <sub>2</sub> (aq)	$4C_{38}H_{78} + 74H_2O \rightarrow 115CH_4 + 37CO_2$	-1287.9	-11.2	M., *	[15]
<b>ALKYLOTROPIC</b>						
<i>n</i> -Tridecylbenzene (l)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{12}CH_3 + 22H_2O \rightarrow 27CH_4 + 11CO_2$	-311.9	-11.6	M., *	[15]
<i>n</i> -Tetradecylbenzene (l)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{13}CH_3 + 46H_2O \rightarrow 57CH_4 + 23CO_2$	-659.7	-11.6	M., *	[15]
<i>n</i> -Pentadecylbenzene (l)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{14}CH_3 + 12H_2O \rightarrow 15CH_4 + 6CO_2$	-173.9	-11.6	M., *	[15]
<i>n</i> -Heptadecylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{16}CH_3 + 26H_2O \rightarrow 33CH_4 + 13CO_2$	-375.4	-11.4	M., *	[15]
<i>n</i> -Octadecylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{17}CH_3 + 54H_2O \rightarrow 69CH_4 + 27CO_2$	-783.1	-11.3	M., *	[15]
<i>n</i> -Nonadecylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{18}CH_3 + 14H_2O \rightarrow 18CH_4 + 7CO_2$	-203.9	-11.3	M., *	[15]
<i>n</i> -Eicosylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{19}CH_3 + 58H_2O \rightarrow 75CH_4 + 29CO_2$	-847.8	-11.3	M., *	[15]
<i>n</i> -Heneicosylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{20}CH_3 + 30H_2O \rightarrow 39CH_4 + 15CO_2$	-440.1	-11.3	M., *	[15]
<i>n</i> -Docosylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{21}CH_3 + 62H_2O \rightarrow 81CH_4 + 31CO_2$	-912.4	-11.3	M., *	[15]
<i>n</i> -Tricosylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{22}CH_3 + 16H_2O \rightarrow 21CH_4 + 8CO_2$	-236.2	-11.2	M., *	[15]
<i>n</i> -Tetracosylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{23}CH_3 + 66H_2O \rightarrow 87CH_4 + 33CO_2$	-977.1	-11.2	M., *	[15]
<i>n</i> -Pentacosylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{24}CH_3 + 34H_2O \rightarrow 45CH_4 + 17CO_2$	-504.7	-11.2	M., *	[15]
<i>n</i> -Hexacosylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{25}CH_3 + 70H_2O \rightarrow 93CH_4 + 35CO_2$	-1041.7	-11.2	M., *	[15]
<i>n</i> -Heptacosylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{26}CH_3 + 18H_2O \rightarrow 24CH_4 + 9CO_2$	-268.5	-11.2	M., *	[15]
<i>n</i> -Octacosylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{27}CH_3 + 74H_2O \rightarrow 99CH_4 + 37CO_2$	-1106.4	-11.2	M., *	[15]
<i>n</i> -Nonacosylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{28}CH_3 + 38H_2O \rightarrow 51CH_4 + 19CO_2$	-569.4	-11.2	M., *	[15]
<i>n</i> -Triacontylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{29}CH_3 + 78H_2O \rightarrow 105CH_4 + 39CO_2$	-1171.0	-11.2	M., *	[15]
<i>n</i> -Hentriacontylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{30}CH_3 + 17H_2O \rightarrow 27CH_4 + 10CO_2$	-300.8	-11.1	M., *	[15]
<i>n</i> -Dotriacontylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{31}CH_3 + 82H_2O \rightarrow 111CH_4 + 41CO_2$	-1235.7	-11.1	M., *	[15]
<i>n</i> -Tritriacontylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{32}CH_3 + 42H_2O \rightarrow 57CH_4 + 21CO_2$	-634.0	-11.1	M., *	[15]
<i>n</i> -Tetraatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{33}CH_3 + 86H_2O \rightarrow 117CH_4 + 43CO_2$	-1300.4	-11.1	M., *	[15]

<i>n</i> -Pentatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{34}CH_3 + 22H_2O \rightarrow 30CH_4 + 11CO_2$	-333.2	-11.1	M., *	[15]
<i>n</i> -Hexatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{35}CH_3 + 90H_2O \rightarrow 123CH_4 + 45CO_2$	-1365.0	-11.1	M., *	[15]
<i>n</i> -Heptatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$2C_6H_5(CH_2)_{36}CH_3 + 46H_2O \rightarrow 63CH_4 + 23CO_2$	-698.7	-11.1	M., *	[15]
<i>n</i> -Octatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$4C_6H_5(CH_2)_{37}CH_3 + 94H_2O \rightarrow 129CH_4 + 47CO_2$	-1429.7	-11.1	M., *	[15]
<i>n</i> -Nonatriacontylbenzene (s)	CO <sub>2</sub> (aq)	$C_6H_5(CH_2)_{38}CH_3 + 24H_2O \rightarrow 33CH_4 + 12CO_2$	-365.5	-11.1	M., *	[15]
<i>n</i> -Tridecylcyclohexane (l)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{12}CH_3 + 38H_2O \rightarrow 57CH_4 + 19CO_2$	+244.6	+4.3	M., *	[15]
<i>n</i> -Tetradecylcyclohexane (l)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{13}CH_3 + 10H_2O \rightarrow 5CH_4 + 5CO_2$	+50.9	+3.4	M., *	[15]
<i>n</i> -Pentadecylcyclohexane (l)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{14}CH_3 + 42H_2O \rightarrow 63CH_4 + 21CO_2$	+160.0	+2.5	M., *	[15]
<i>n</i> -Heptadecylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{16}CH_3 + 46H_2O \rightarrow 69CH_4 + 23CO_2$	+144.3	+2.1	M., *	[15]
<i>n</i> -Octadecylcyclohexane (s)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{17}CH_3 + 12H_2O \rightarrow 18CH_4 + 6CO_2$	+27.7	+1.5	M., *	[15]
<i>n</i> -Nonadecylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{18}CH_3 + 50H_2O \rightarrow 75CH_4 + 25CO_2$	+77.0	+1.0	M., *	[15]
<i>n</i> -Eicosylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_6H_{11}(CH_2)_{19}CH_3 + 26H_2O \rightarrow 39CH_4 + 13CO_2$	+21.7	+0.6	M., *	[15]
<i>n</i> -Heneicosylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{20}CH_3 + 54H_2O \rightarrow 81CH_4 + 27CO_2$	+9.7	+0.1	M., *	[15]
<i>n</i> -Docosylcyclohexane (s)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{21}CH_3 + 14H_2O \rightarrow 21CH_4 + 7CO_2$	-6.0	-0.3	M., *	[15]
<i>n</i> -Tricosylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{22}CH_3 + 58H_2O \rightarrow 87CH_4 + 29CO_2$	-57.6	-0.7	M., *	[15]
<i>n</i> -Tetracosylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_6H_{11}(CH_2)_{23}CH_3 + 30H_2O \rightarrow 45CH_4 + 15CO_2$	-45.6	-1.0	M., *	[15]
<i>n</i> -Pentacosylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{24}CH_3 + 62H_2O \rightarrow 93CH_4 + 31CO_2$	-124.9	-1.3	M., *	[15]
<i>n</i> -Hexacosylcyclohexane (s)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{25}CH_3 + 16H_2O \rightarrow 24CH_4 + 8CO_2$	-39.6	-1.7	M., *	[15]
<i>n</i> -Heptacosylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{26}CH_3 + 66H_2O \rightarrow 99CH_4 + 33CO_2$	-192.2	-1.9	M., *	[15]
<i>n</i> -Octacosylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_6H_{11}(CH_2)_{27}CH_3 + 34H_2O \rightarrow 51CH_4 + 17CO_2$	-112.2	-2.2	M., *	[15]
<i>n</i> -Nonacosylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{28}CH_3 + 70H_2O \rightarrow 105CH_4 + 35CO_2$	-259.5	-2.5	M., *	[15]
<i>n</i> -Triacetyl cyclohexane (s)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{29}CH_3 + 18H_2O \rightarrow 27CH_4 + 9CO_2$	-73.3	-2.7	M., *	[15]
<i>n</i> -Hentriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{30}CH_3 + 74H_2O \rightarrow 111CH_4 + 37CO_2$	-326.8	-2.9	M., *	[15]
<i>n</i> -Dotriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_6H_{11}(CH_2)_{31}CH_3 + 38H_2O \rightarrow 57CH_4 + 19CO_2$	-180.2	-3.2	M., *	[15]
<i>n</i> -Tritriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{32}CH_3 + 78H_2O \rightarrow 117CH_4 + 39CO_2$	-394.1	-3.4	M., *	[15]
<i>n</i> -Tetraatriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$C_6H_{11}(CH_2)_{33}CH_3 + 20H_2O \rightarrow 30CH_4 + 10CO_2$	-106.9	-3.6	M., *	[15]
<i>n</i> -Pentatriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{34}CH_3 + 82H_2O \rightarrow 123CH_4 + 41CO_2$	-461.4	-3.8	M., *	[15]
<i>n</i> -Hexatriacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_6H_{11}(CH_2)_{35}CH_3 + 42H_2O \rightarrow 63CH_4 + 21CO_2$	-247.5	-3.9	M., *	[15]
<i>n</i> -Heptacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_6H_{11}(CH_2)_{36}CH_3 + 86H_2O \rightarrow 129CH_4 + 43CO_2$	-528.7	-4.1	M., *	[15]

<i>n</i> -Octacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$C_{6}H_{11}(CH_{2})_{37}CH_{3} + 22H_{2}O \rightarrow 33CH_{4} + 11CO_{2}$	-140.6	-4.3	M., *	[15]
<i>n</i> -Nonacontylcyclohexane (s)	CO <sub>2</sub> (aq)	$4C_{6}H_{11}(CH_{2})_{38}CH_{3} + 90H_{2}O \rightarrow 135CH_{4} + 45CO_{2}$	-596.0	-4.4	M., *	[15]
<i>n</i> -Tetracontylcyclohexane (s)	CO <sub>2</sub> (aq)	$2C_{6}H_{11}(CH_{2})_{39}CH_{3} + 46H_{2}O \rightarrow 69CH_{4} + 23CO_{2}$	-314.8	-4.6	M., *	[15]
<b>FATTY ACIDS OXIDATION</b>						
<i>n</i> -Hexanoate (aq)	CO <sub>2</sub> (aq)	$CH_{3}(CH_{2})_{4}CO_{2}^{-} + H^{+} + 2H_{2}O \rightarrow 4CH_{4} + 2CO_{2}$	-113.3	-14.2	G., **	[13]
<i>n</i> -Heptanoate (aq)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{5}CO_{2}^{-} + 4H^{+} + 10H_{2}O \rightarrow 19CH_{4} + 9CO_{2}$	-278.6	-14.7	G., **	[13]
<i>n</i> -Octanoate (aq)	CO <sub>2</sub> (aq)	$2CH_{3}(CH_{2})_{6}CO_{2}^{-} + 2H^{+} + 6H_{2}O \rightarrow 11CH_{4} + 5CO_{2}$	-165.4	-15.0	G., **	[13]
<i>n</i> -Nonanoic acid (l)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{7}CO_{2}H + 14H_{2}O \rightarrow 25CH_{4} + 11CO_{2}$	-427.7	-17.1	G., **	[13]
<i>n</i> -Decanoic acid (s)	CO <sub>2</sub> (aq)	$CH_{3}(CH_{2})_{8}CO_{2}H + 4H_{2}O \rightarrow 7CH_{4} + 3CO_{2}$	-249.2	-17.8	G., **	[13]
<i>n</i> -Undecanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{9}CO_{2}H + 18H_{2}O \rightarrow 31CH_{4} + 13CO_{2}$	-534.5	-17.2	G., **	[13]
<i>n</i> -Dodecanoic acid (s)	CO <sub>2</sub> (aq)	$2CH_{3}(CH_{2})_{10}CO_{2}H + 10H_{2}O \rightarrow 17CH_{4} + 7CO_{2}$	-285.4	-16.8	G., **	[13]
<i>n</i> -Tridecanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{11}CO_{2}H + 22H_{2}O \rightarrow 37CH_{4} + 15CO_{2}$	-607.0	-16.4	G., **	[13]
<i>n</i> -Tetradecanoic acid (s)	CO <sub>2</sub> (aq)	$CH_{3}(CH_{2})_{12}CO_{2}H + 6H_{2}O \rightarrow 10CH_{4} + 4CO_{2}$	-321.6	-16.1	G., **	[13]
<i>n</i> -Pentadecanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{13}CO_{2}H + 26H_{2}O \rightarrow 43CH_{4} + 17CO_{2}$	-679.4	-15.8	G., **	[13]
<i>n</i> -Hexadecanoic acid (s)	CO <sub>2</sub> (aq)	$2CH_{3}(CH_{2})_{14}CO_{2}H + 14H_{2}O \rightarrow 23CH_{4} + 9CO_{2}$	-357.8	-15.6	G., **	[13]
<i>n</i> -Heptadecanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{15}CO_{2}H + 30H_{2}O \rightarrow 49CH_{4} + 19CO_{2}$	-751.9	-15.3	G., **	[13]
<i>n</i> -Octadecanoic acid (s)	CO <sub>2</sub> (aq)	$CH_{3}(CH_{2})_{16}CO_{2}H + 8H_{2}O \rightarrow 13CH_{4} + 5CO_{2}$	-394.1	-15.2	G., **	[13]
<i>n</i> -Nonadecanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{17}CO_{2}H + 34H_{2}O \rightarrow 55CH_{4} + 21CO_{2}$	-824.3	-15.0	G., **	[13]
<i>n</i> -Eicosanoic acid (s)	CO <sub>2</sub> (aq)	$2CH_{3}(CH_{2})_{18}CO_{2}H + 18H_{2}O \rightarrow 29CH_{4} + 11CO_{2}$	-430.3	-14.8	G., **	[13]
<i>n</i> -Heneicosanoic acid (s)	CO <sub>2</sub> (aq)	$4CH_{3}(CH_{2})_{19}CO_{2}H + 38H_{2}O \rightarrow 61CH_{4} + 23CO_{2}$	-896.8	-14.7	G., **	[13]

## References

- [1] Dean, J.A., 1999. Lange's Handbook of Chemistry, fifteenth ed. MacGraw-Hill, Inc., New York.
- [2] Haynes, W.M., Lide, D.R., Bruno, T.J., 2014. CRC Handbook of Chemistry and Physics, ninety-fifth ed., CRC Press, Boca Raton
- [3] Mayumi, D., Mochimaru, H., Tamaki, H., Yamamoto, K., Yoshioka, H., Suzuki, Y., et al., 2016. Methane production from coal by a single methanogen. *Science* 354, 222–225. <https://doi.org/10.1126/science.aaf8821>
- [4] Müller, V., Kozianowski, G., Blaut, M., Gottschalk, G., 1987. Methanogenesis from trimethylamine + H<sub>2</sub> by *Methanosarcina barkeri* is coupled to ATP formation by a chemiosmotic mechanism. *Biochimica et Biophysica Acta (BBA) - Bioenergetics* 892, 207–212. [https://doi.org/10.1016/0005-2728\(87\)90176-9](https://doi.org/10.1016/0005-2728(87)90176-9)
- [5] Steiniger, F., Sorokin, D.Y., Deppenmeier, U., 2021. Process of energy conservation in the extremely haloalkaliphilic methyl-reducing methanogen *Methanonatronarchaeum thermophilum*. *The FEBS Journal* n/a. <https://doi.org/10.1111/febs.16165>
- [6] Sorokin, D.Y., Merkel, A.Y., Abbas, B., Makarova, K.S., Rijpstra, W.I.C., Koenen, M., et al., 2018. *Methanonatronarchaeum thermophilum* gen. nov., sp. nov. and “*Candidatus Methanohalarchaeum thermophilum*”, extremely halo(natrono)philic methyl-reducing methanogens from hypersaline lakes comprising a new euryarchaeal class *Methanonatronarchaeia* classis nov. *International Journal of Systematic and Evolutionary Microbiology*, 68, 2199–2208. <https://doi.org/10.1099/ijsem.0.002810>
- [7] Sorokin, D.Y., Merkel, A.Y., Abbas, B., 2022. Ecology of *Methanonatronarchaeia*. *Environmental Microbiology* n/a. <https://doi.org/10.1111/1462-2920.16108>
- [8] Tanaka, K., 1994. Anaerobic degradation of tetramethylammonium by a newly isolated marine methanogen. *Journal of Fermentation and Bioengineering* 78, 386–388. [https://doi.org/10.1016/0922-338X\(94\)90287-9](https://doi.org/10.1016/0922-338X(94)90287-9)
- [9] Finster, K., Tanimoto, Y., Bak, F., 1992. Fermentation of methanethiol and dimethylsulfide by a newly isolated methanogenic bacterium. *Arch. Microbiol.* 157, 425–430. <https://doi.org/10.1007/BF00249099>
- [10] Hippe, H., Caspari, D., Fiebig, K., Gottschalk, G., 1979. Utilization of trimethylamine and other *N*-methyl compounds for growth and methane formation by *Methanosarcina barkeri*. *PNAS* 76, 494–498. <https://doi.org/10.1073/pnas.76.1.494>
- [11] Fahlbusch, K., Hippe, H., Gottschalk, G., 1983. Formation of ethylamine and methane from dimethylethylamine by *Methanosarcina barkeri*. *FEMS Microbiology Letters* 19, 103–104. <https://doi.org/10.1111/j.1574-6968.1983.tb00519.x>
- [12] Boopathy, R., 1996. Methanogenic transformation of methylfurfural compounds to furfural. *Appl Environ Microbiol* 62, 3483–3485. <https://doi.org/10.1128/aem.62.9.3483-3485.1996>
- [13] Borrel, G., Adam, P.S., McKay, L.J., Chen, L.-X., Sierra-García, I.N., Sieber, C.M.K., et al., 2019. Wide diversity of methane and short-chain alkane metabolisms in uncultured archaea. *Nature Microbiology* 4, 603–613. <https://doi.org/10.1038/s41564-019-0363-3>
- [14] Laso-Pérez, R., Hahn, C., Vliet, D.M. van, Tegetmeyer, H.E., Schubotz, F., Smit, N.T., et al., 2019. Anaerobic Degradation of Non-Methane Alkanes by “*Candidatus Methanoliparia*” in Hydrocarbon Seeps of the Gulf of Mexico. *mBio* 10. <https://doi.org/10.1128/mBio.01814-19>
- [15] Zhou, Z., Zhang, C., Liu, P., Fu, L., Laso-Pérez, R., Yang, L., et al., 2022. Non-syntrophic methanogenic hydrocarbon degradation by an archaeal species. *Nature*. <https://doi.org/10.1038/s41586-021-04235-2>