

Supplementary Materials

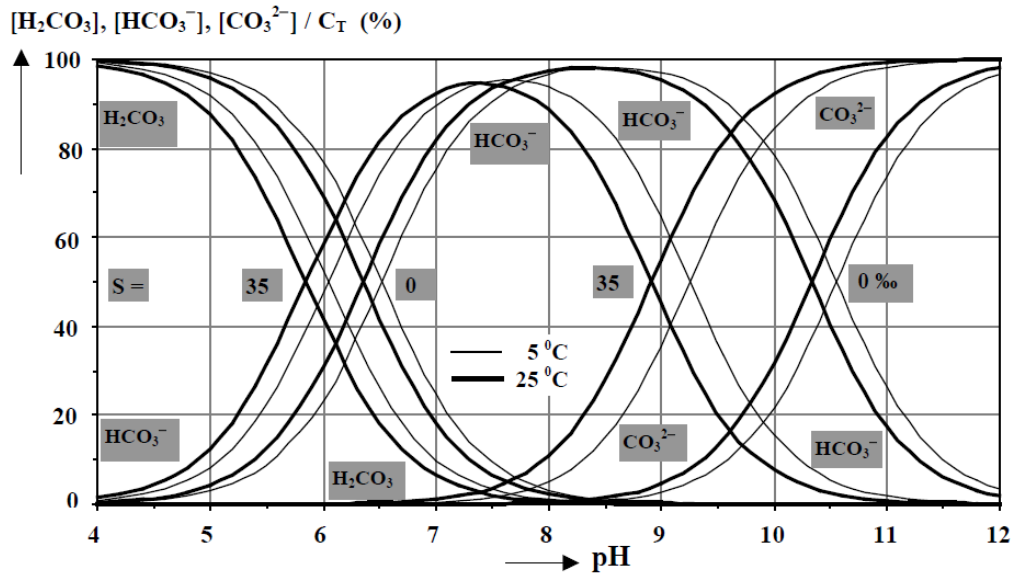


Figure S1. Distribution of the carbonic acid fractions as the percentages of the total carbon content, C_T . The values were calculated for temperatures of 5 and 25 °C and for salinities of 0‰ and 35‰ as a function of the pH [4].

Table S1. H_2 -releasing/consuming reactions of substrates relevant.

(a) Acetate-type Fermentation		$\Delta G'$ (kJ/mol)
Glucose + 4H ₂ O → 2Acetate ⁻ + 2HCO ₃ ⁻ + 4H ⁺ + 4H ₂		-206.3
Acetate ⁻ + 4H ₂ O → 2HCO ₃ ⁻ + H ⁺ + 4H ₂		+104.6
(b) Butyrate-type Fermentation		$\Delta G'$ (kJ/mol)
Glucose + 2H ₂ O → 1Butyrate ⁻ + 2HCO ₃ ⁻ + 3H ⁺ + 2H ₂		-254.8
Butyrate ⁻ + 2H ₂ O → 2Acetate ⁻ + H ⁺ + 2H ₂		+48.1
Butyrate ⁻ + 10H ₂ O → 4HCO ₃ ⁻ + 3H ⁺ + 10H ₂		+257.3
(c) Ethanol-type Fermentation		$\Delta G'$ (kJ/mol)
Glucose → 2Pyruvate ⁻ + 2H ⁺ + 2H ₂		-112.1
Pyruvate ⁻ + H ₂ O + H ₂ → Ethanol + HCO ₃ ⁻		-56.9
2Ethanol + acetate ⁻ → Caproate ⁻ + 2H ₂ O		-77.4
Ethanol + acetate ⁻ → Butyrate ⁻ + H ₂ O		-38.6
Acetate ⁻ + H ⁺ + 2H ₂ → Ethanol + H ₂ O		-9.6
Ethanol + H ₂ O → Acetate ⁻ + H ⁺ + 2H ₂		+9.6
(d) Lactate-type Fermentation		$\Delta G'$ (kJ/mol)
Glucose → 2Pyruvate ⁻ + 2H ⁺ + 2H ₂		-112.1
Pyruvate ⁻ + H ₂ → Lactate ⁻ + HCO ₃ ⁻		-43.1
Lactate ⁻ + H ₂ → Propionate ⁻ + H ₂ O		-79.9
Lactate ⁻ → 1/4Acetate ⁻ + 1/4propionate ⁻ + 1/4butyrate ⁻ + 3/4CO ₂ + 1/2H ₂ + 1/4H ⁺		-48.7
Lactate ⁻ + 2H ₂ O → Acetate ⁻ + HCO ₃ ⁻ + H ⁺ + 2H ₂		-4.2

Table S2. Type of hydrogen fermentation and its characteristics.

Fermentation type	Major Products	Minor Products	Typical pH range	Microorganisms	Reference
Butyrate-type	Butyrate, Acetate	some propionate	< 5, >6	<i>C. pasteurianum</i>	[1]
				<i>C. butyricum</i>	[6]
				<i>C. acetobutylicum</i>	[3]
Ethanol-type	Ethanol Butyrate	some acetate	approximate 4.5	<i>C. kluyveri</i>	[9]
				<i>C. thermohydrosulfuricum</i>	[2]
				<i>C. acetobutylicum</i>	[3]
Lactate-type	Propionate Acetate	Some lactate	5–6	<i>C. barkeri</i>	[8]
				<i>C. arcticum</i>	[5]
				<i>C. cellulolyticum</i>	[7]

References

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