

Supporting information

Table S1: Composition of the liquid cultivation medium (Doll et al., 2018) used for precultures in anaerobic shaken bottles and batch processes in stirred-tank bioreactors.

Component	Formula	Concentration in Stock solution, g L ⁻¹
Mineral solution		33.3x
Ammoniumchloride	NH ₄ Cl	100
Sodium chloride	NaCl	80
Potassium chloride	KCl	10
Potassium dihydrogen phosphate	KH ₂ PO ₄	10
Magnesium sulfate	MgSO ₄	20
Calcium chloride	CaCl ₂	4
Vitamin solution		100x
Pyridoxine	C ₈ H ₁₁ NO ₃	0.01
Thiamine	C ₁₂ H ₁₇ ClN ₄ OS	0.005
Riboflavine	C ₁₇ H ₂₀ N ₄ O ₆	0.005
Calcium pantothenate	Ca(C ₉ H ₁₆ NO ₅) ₂	0.005
Liponic acid	C ₈ H ₁₄ O ₂ S ₂	0.005
Para amino benzoic acid	C ₇ H ₇ NO ₂	0.005
Nicotinic acid	C ₆ H ₅ NO ₂	0.005
Vitamin B12	C ₇₂ H ₁₀₀ CoN ₁₈ O ₁₇ P	0.005
D-biotine	C ₁₀ H ₁₆ N ₂ O ₃ S	0.002
Folic acid	C ₁₉ H ₁₉ N ₇ O ₆	0.002
2 mercapto ethane sulfonic acid	C ₂ H ₆ O ₃ S ₂	0.02
Trace element solution		100x
Nitrilotriacetic acid	C ₆ H ₉ NO ₆	2.00
Mangan sulfate	MnSO ₄	1.00
Ammonium iron sulfate	NH ₄ Fe(SO ₄) ₂	0.80
Cobalt chloride	CoCl ₂	0.20
Zinc sulfate	ZnSO ₄	0.20
Copper chloride	CuCl ₂	0.02
Nickel chloride	NiCl ₂	0.02
Sodium molybdate	Na ₂ MoO ₄	0.02
Sodium selenate	Na ₂ SeO ₄	0.02
Sodium wolframate	Na ₂ WO ₄	0.02
		Medium concentration
Yeast extract		1.0 g L ⁻¹
Cysteine hydrochloride ^{a)}	C ₃ H ₇ NO ₂ S HCl	0.4 g L ⁻¹
Morpholino ethane sulfonic acid ^{b)}	C ₆ H ₁₃ NO ₄ S	15.0 g L ⁻¹

a) not used for heterotrophic preculture in anaerobic shaken bottles

b) only used for heterotrophic preculture in anaerobic shaken bottles

Table S2: Selected process performance data of the mixotrophic batch processes with 16.4 g L⁻¹ D-fructose and the heterotrophic batch process with 14.4 g L⁻¹ L-arabinose with *C. autoethanogenum* in stirred-tank bioreactors with continuous gassing (390 mbar N₂, 300 mbar CO, 220 mbar H₂, and 90 mbar CO₂). (F_{gas} = 5 NL h⁻¹, 37°C, pH 6.0, and P V⁻¹ = 15.1 W L⁻¹).

	D-Fructose mixotroph	L-Arabinose heterotroph
C _{initial} , g L ⁻¹	16.4	14.4
μ _{max} , g L ⁻¹	0.33	0.18
CDW _{max} , g L ⁻¹	0.93	1.89
C _{Acetate,final} , g L ⁻¹	2.88	8.36
C _{Ethanol,final} , g L ⁻¹	4.44	0.31
C _{D-2,3-butanediol, final} , g L ⁻¹	0.12	0.13
C _{meso 2,3-butanediol, final} , g L ⁻¹	--	-
Ratio _{Alcohol:Acetate} , g g ⁻¹	1.20	0.05
Carbon in medium, mmol C L ⁻¹	9.94	9.94
Carbon in biomass, mmol C L ⁻¹	29.33	59.69
Carbon in product, mmol C L ⁻¹	311.46	345.29
CO consumption, mmol C L ⁻¹	213.46	-
CO ₂ production, mmol C L ⁻¹	327.87	-
CO consumption _{max} , mmol L h ⁻¹	13.58	-
C-balance (recovery), %	98.74	90.57

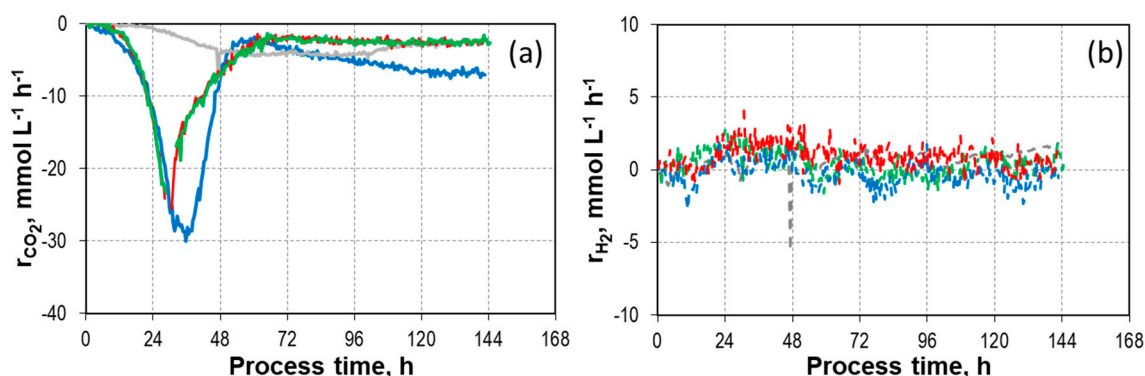


Figure S1: (a) CO₂ formation rate and (b) H₂ uptake rate of mixotrophic batch processes with varying initial D-xylose concentrations (♦ 10.3 g L⁻¹, ♦ 13.7 g L⁻¹, and ♦ 19.3 g L⁻¹) with *C. autoethanogenum* in stirred-tank bioreactors with continuous gassing (390 mbar N₂, 300 mbar CO, 220 mbar H₂, and 90 mbar CO₂) compared to the autotrophic reference batch process (grey line). (F_{gas} = 5 NL h⁻¹, 37°C, pH 6.0, and P V⁻¹ = 15.1 W L⁻¹).

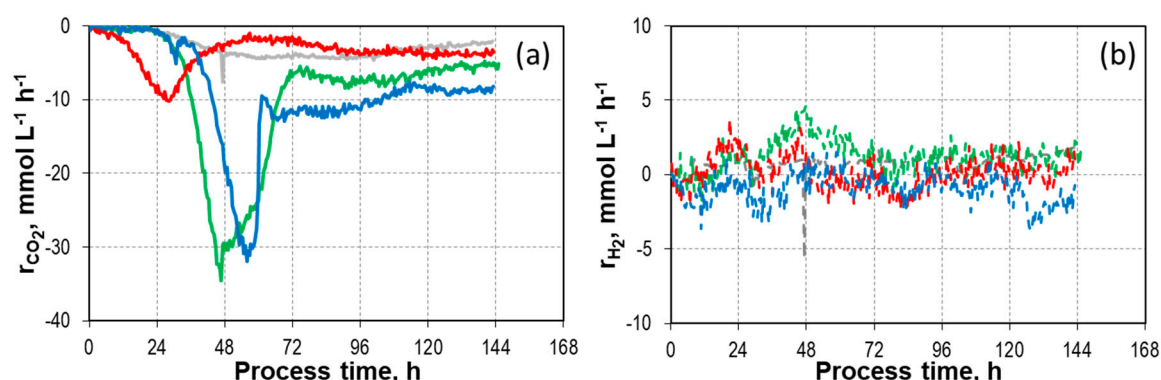


Figure S2: (a) CO₂ formation rate and (b) H₂ uptake rate with varying initial L-arabinose concentrations (■ 9.8 g L⁻¹, ■ 14.2/14.7 g L⁻¹, and ■ 18.8 g L⁻¹) with *C. autoethanogenum* in stirred-tank bioreactors with continuous gassing (390 mbar N₂, 300 mbar CO, 220 mbar H₂, and 90 mbar CO₂) compared to the autotrophic reference batch process (grey line). ($F_{\text{gas}} = 5 \text{ NL h}^{-1}$, 37°C, pH 6.0, and $P \text{ V}^{-1} = 15.1 \text{ W L}^{-1}$).

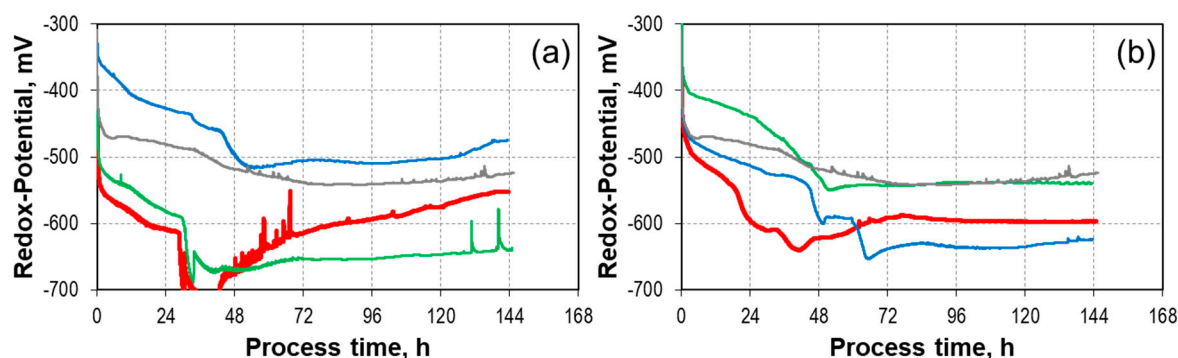


Figure S3: Redox-potential of mixotrophic batch processes (a) with varying initial D-xylose concentrations (◆ 10.3 g L⁻¹, ◆ 13.7 g L⁻¹, and ◆ 19.3 g L⁻¹) and (b) with varying initial L-arabinose concentrations (■ 9.8 g L⁻¹, ■ 14.2/14.7 g L⁻¹, and ■ 18.8 g L⁻¹) with *C. autoethanogenum* in stirred-tank bioreactors with continuous gassing (390 mbar N₂, 300 mbar CO, 220 mbar H₂, and 90 mbar CO₂) compared to the autotrophic reference batch process (grey line). ($F_{\text{gas}} = 5 \text{ NL h}^{-1}$, 37°C, pH 6.0, and $P \text{ V}^{-1} = 15.1 \text{ W L}^{-1}$).

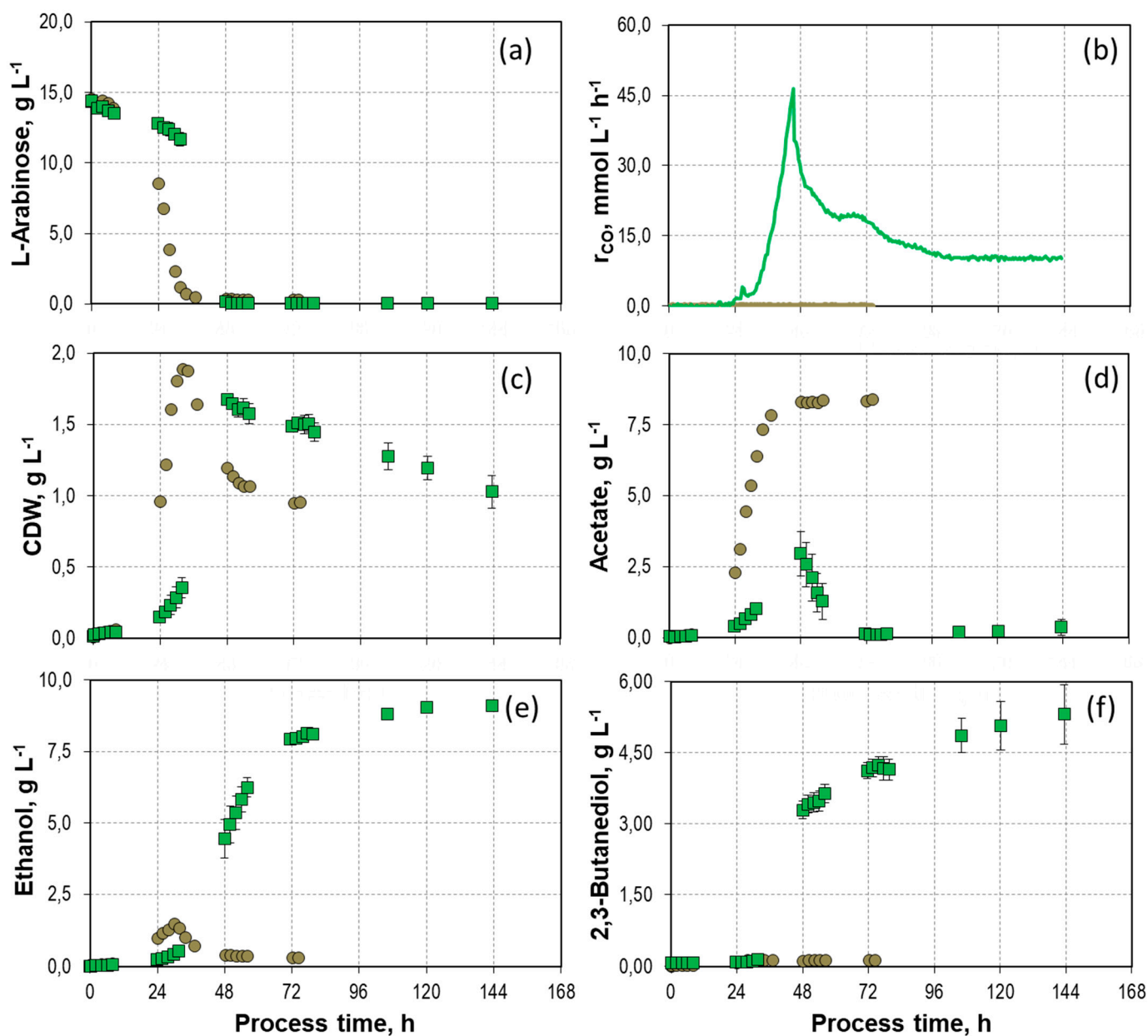


Figure S4: Process performance of a heterotrophic batch process with 14.4 g L⁻¹ L-arabinose (●) compared to a mixotrophic batch process with 14.2/14.7 g L⁻¹ L-arabinose (■) with *C. autoethanogenum* in stirred-tank bioreactors with continuous gassing (390 mbar N₂, 300 mbar CO, 220 mbar H₂, and 90 mbar CO₂; F_{gas} = 5 NL h⁻¹, 37°C, pH 6.0, and P V⁻¹ = 15.1 W L⁻¹). The error bars indicate the minimum and maximum values of two individual mixotrophic processes with 14.26 g L⁻¹ and 14.70 g L⁻¹.