Table I. Degree of reduction (γ_i) of substrates and products and C-molar enthalpies of respiration ($\Delta_{kr}H$)[a] and C-molar enthalpy of ethanol fermentation ($\Delta_{kf}H$).[a]

Substrate	γ_i [c]	kJ/C-mol $\Delta_{kr}H$	$\Delta_{kf}H$
Acetic acid (*aq*)	4	−436.7	
α,β-D Glucose (*aq*)	4	−468.7	−16.2
Glycerol (*aq*)	4.67	−549.1	
Ethanol (*aq*)	6	−678.7	
Ammonium ion (*aq*)	0	−296.2[b]	

[a] Calculated from tabulated values of heat of formation ($\Delta_f H$) 25°C[33] and corrected for the aqueous state (see Theory and Calculations). The C-molar enthalpies of respiration of the growth process are the C-molar enthalpies of combustion of the tabulated substrates when corrected for the aqueous state.

[b] kJ/N-mol.

[c] γ_i = Degree of reduction of substrates/products, expressing the number of available electrons per unit carbon atom, of a C-molar compound ($c = 1$)[2,10,22,25] and calculated as $\gamma_i = 4\text{C} + \text{H} - 2\text{O} - 3\text{N}$, where C, H, O, and N denote the atomic coefficient of the elements. This expression of the degree of reduction, which includes the factor −3N, is used in the continuous calculations of substrate and product concentrations (see Text for explanation) from the rate of heat production, to compensate for the electrons donated to the biomass from ammonia [eqs. (7–9)]. The degree of reduction obtained from the elemental composition for the biomass (γ_X) then becomes 4.16.

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