TABLE 1 Oxidation states of *R. palustris* biomass and growth substrates and the H_2 yield from each substrate

Compound	Formula	Oxidation state[b]	H_2 yield (mol H_2/100 mol organic C consumed)[c]
Fumarate	$C_4H_4O_4$	+1	18 ± 3[d]
Succinate	$C_4H_6O_4$	+0.5	23 ± 1
Acetate	$C_2H_4O_2$	0	21 ± 3
Biomass[a]	$CH_{1.8}N_{0.18}O_{0.38}$	−0.5	
Butyrate	$C_4H_8O_2$	−1	41 ± 10

[a] Based on the elemental composition of *R. palustris* 42OL (25).

[b] Values were determined for each carbon atom as described previously (7, 26) and then averaged by dividing the sum by the number of carbon atoms.

[c] NifA* cultures were grown in minimal medium with NH_4^+ as the nitrogen source. Values are averages from 3 to 5 biological replicates ± standard deviations (SD) based on samples taken during early exponential growth. Values are normalized for organic C consumed to account for the different carbon contents between acetate and the other substrates.

[d] Calculated by grouping fumarate and malate as a single metabolite [i.e., dH_2/d(fumarate + malate) × 100/4 carbon atoms]. The H_2 yield from fumarate consumed alone would give a value of 12 ± 2.