1 NOMENCLATURE

EC number
1.12.2.1

Systematic name
Hydrogen:ferricytochrome-c₃ oxidoreductase

Recommended name
Cytochrome-c₃ hydrogenase

Synonyms
Hydrogenase
Hydrogenase, cytochrome
Cytochrome c₃ hydrogenase
Cytochrome c₃ reductase
Cytochrome hydrogenase
H₂:ferricytochrome-c₃ oxidoreductase

More (may be identical to EC 1.18.3.1, hydrogenase which can use a cytochrome c (not precisely characterized) as electron acceptor:
Paracoccus denitrificans [20], Alcaligenes latus [21], Alcaligenes eutrophus [22]) [20-22]

CAS Reg. No.
9079-91-8

2 REACTION AND SPECIFICITY

Catalysed reaction
H₂ + ferricytochrome c₃ →
→ 4 H⁺ + ferrocytochrome c₃

Reaction type
Redox reaction

Natural substrates
H₂ + ferricytochrome c₃ (enzyme participates in production or consumption of H₂ in bacterial metabolism) [6]
H⁺ + ferrocytochrome c₃ (enzyme participates in production or consumption of H₂ in bacterial metabolism) [6]
Cytochrome-c₃ hydrogenase

Substrate spectrum
1. \( H_2 + \) ferricytochrome c₃ (\( r [4, 5, 15, 18] \)), \( H_2 \)-evolution: Desulfovibrio multispirans enzyme is more active in hydrogen evolution rather than in hydrogen uptake assay [15], Desulfovibrio vulgaris [1, 6, 7], Desulfovibrio gigas [1, 14], Desulfovibrio desulfuricans [1, 4, 5], Desulfovibrio baculatus [12], \( H_2 \)-consumption: Desulfovibrio vulgaris [1, 6, 7], Desulfovibrio desulfuricans [1, 4, 5], Desulfovibrio multispirans (more active in hydrogen evolution rather than in hydrogen uptake assay) [15], other electron carriers: methyl viologen [4, 5, 18], benzyl viologen [4, 5], methylene blue [4, 5], ferricyanide [18], 2,6-dichlorophenolindophenol [18], no activity as electron carriers: NADP⁺ [18], FAD [18], FMN [18], \( O_2 \) [18], Desulfovibrio vulgaris: reduces cytochrome c₃ but not cytochrome c₅₅₃ [1], Desulfovibrio gigas: cytochrome c₃ required for reduction of ferredoxin, rubredoxin and cytochrome c₃ with hydrogen and for the evolution of hydrogen from dithionite [1]) [1, 4-7, 12, 14, 15, 18]

2. More (hydrogenases which can use a cytochrome c (not precisely characterized) as electron acceptor: Paracoccus denitrificans [20], Alcaligenes latus [21], Alcaligenes eutrophus [22]) [20-22]

Product spectrum
1. \( H^+ + \) ferrocytochrome c₃ (\( r [4, 5, 15, 18] \))

2. ?

Inhibitor(s)
CO ((NiFe)hydrogenase from Desulfovibrio gigas has lower sensitivity to CO inhibition than (Fe)hydrogenase from Desulfovibrio vulgaris [1], (Fe) and (NiFeSe)hydrogenase sensitive, (NiFe)enzyme slightly inhibited [16]) [1, 4-6, 16]; \( O_2 \) (Desulfovibrio desulfuricans (Norway), reversible inactivation) [1]; Bromosuccinimide [4]; HgCl₂ [4]; SDS [6]; p-Chloromercuribenzoate [6]; Dimethylsulfoxide [7]; NO ((NiFe)hydrogenase, (Fe) hydrogenase and (NiFeSe)hydrogenase sensitive) [16]; \( NO_2^- \) ((Fe)hydrogenase and (NiFeSe)hydrogenase sensitive, (NiFe) hydrogenase uneffected) [16]; High ionic strength [4, 7]; More (resistant to inhibition by thiol-blocking and metal-complexing reagents) [4]

Cofactor(s)/prosthetic group(s)
Cytochrome c₃ (rate enhancement in \( H_2 \)-evolution assay with methyl viologen) [4]