

ELECTROCHEMISTRY OF CELLOBIOSE
DEHYDROGENASE FROM DIFFERENT ORIGINS
AT GOLD AND CARBON ELECTRODES

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Cellobiose dehydrogenase (CDH) is an extracellular enzyme produced by a number of wood degrading fungi. This enzyme catalyses the oxidation of cellobiose, lactose and cellodextrins by a variety of electron acceptors such as quinones, cytochrome *c* and to a small extent by oxygen. CDH is a bifunctional enzyme, containing two cofactors: a cytochrome *b* type heme and flavin adenine dinucleotide (FAD). The FAD domain is responsible for the enzyme's catalytic activity for sugar oxidation, whereas the heme domain has no enzyme activity. Also the subsequent reduction of two-electron acceptors, *e.g.* quinone and oxygen, was found to occur at the FAD domain. However, in the case of one-electron acceptors, *e.g.* cytochrome *c* and ferricyanide, it is currently debated whether it occurs at the FAD or the the heme domain ^{1,2}.

Previously we have shown that graphite ^{3,4} and gold ^{5,6} electrodes can directly accept electrons from the heme of CDH. On graphite direct electron transfer (ET) of CDH was demonstrated by recording mediatorless electrooxidation of cellobiose at the CDH-modified electrode. Quasi-reversible direct ET of the enzyme was demonstrated on thiol-modified gold electrodes by cyclic voltammetry and spectroelectrochemistry. We have shown that the heme domain is responsible for the direct ET, in a similar manner as suggested by Ikeda *et al.* ⁷ for other quino- or flavohemoproteins. CDH modified graphite electrodes have been used both for the determination of sugars ⁸ and diphenols ⁹.

The physicochemical characteristics of heterogeneous and intraprotein ET of CDH from *Phanerochaete chrysosporium* will be discussed. To understand the natural role of ET of CDH enzymes, the ET characteristics will be compared with those obtained for CDHs from two other fungi, *viz.* *Sclerotium rolfsii* and *Humicola insolens*. Its possible role in lignin degradation will also be discussed.

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