Electrocatalyse enzymatique : pourquoi, comment?

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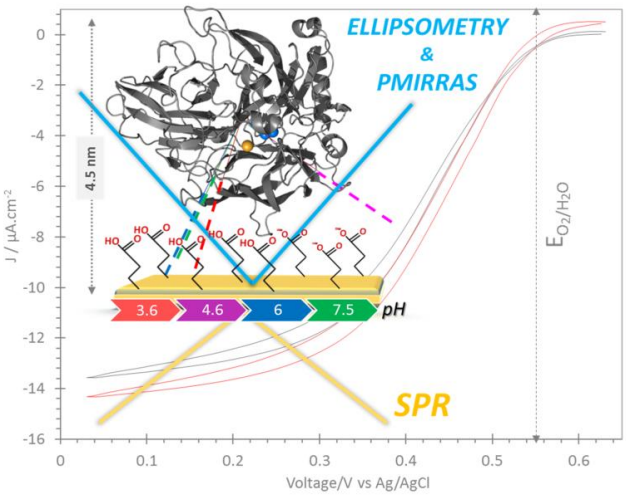
Redox enzymes, that catalyze reactions involving electron transfers in living organisms, are very promising components of biotechnological devices, and can be envisioned for sensing applications as well as for energy conversion [1]. In this context, one of the most significant challenges is to achieve stable and efficient direct electron transfer by tunneling between enzymes and conductive surfaces [2]. Redox enzymes are sizeable proteins with anisotropic properties. Active sites are most often buried inside an insulating protein moiety. Achieving their long term immobilization for efficient catalysis requires specific and controlled orientation at the electrode surface. The fundamental importance of controlling enzyme orientation, how such orientation can be obtained and how it can be verified experimentally are the three main directions that will be discussed in this work. Starting from "in vivo" long distance electron transfer processes inside enzymes and between interacting partners in metabolic chains, we will emphasize the recent understandings we gained through the in-depth study of enzymes for O_2 reduction and H_2 oxidation coming from different microorganisms. Electrochemical interfaces with various surface chemical properties will be considered, with a special focus on self-assembled monolayers on gold and carbon nanotube networks [3]. The ultimate goal is to provide key parameters allowing a rationalization of bioelectrodes.



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