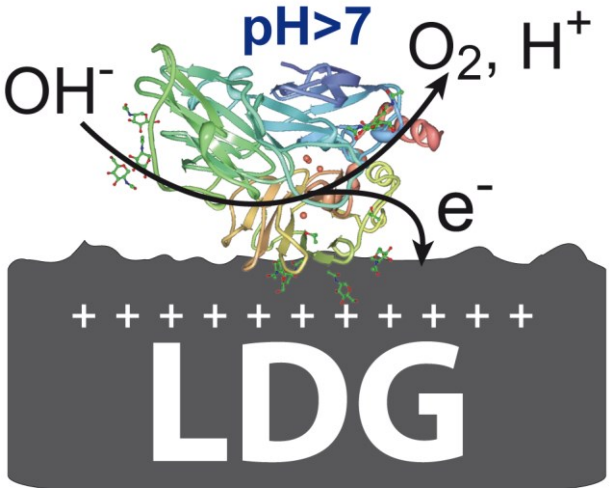
Bioelectrochemical Oxidation of Water

Marcos Pita[a], Diana M. Mate [a], David Gonzalez-Perez [a], Sergey Shleev [b], Victor M. Fernandez [a], Miguel Alcalde[a], Antonio L. De Lacey [a]
[a]*Instituto de Catalisis y Petroleoquimica, CSIC*
C/ Marie Curie, 2, L10. 28049 Madrid, Spain.
[b] *Department of Biomedical Sciences, Faculty of Health and Society,*
Malmö University, 20560 Malmö, Sweden.
marcospita@icp.csic.es

The electrolysis of water provides a link between electrical energy and hydrogen, a high energy density fuel and a versatile energy carrier, but the process is very expensive[1]. Indeed, the main challenge is to reduce energy consumption for large-scale applications using efficient renewable catalysts, which can be produced at low cost. Inspired by the water oxidation process catalyzed by inorganic Cu-complexes,[2] we present the multicopper oxidase laccase as the first ever enzyme reported able to catalyze electrooxidation of H_2O to molecular oxygen. Native and laboratory evolved[3] laccases immobilized onto low-density graphite electrodes serve as bioelectrocatalytic systems with low overpotential and a high O_2 evolution ratio against H_2O_2 production during H_2O electrolysis. Our results open a new research ground on H_2O splitting as they allow overcoming serious practical limitations associated with artificial electrocatalysts used for O_2 evolution nowadays.



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