Electrochemical O₂ activation by Fe and Mn porphyrins. Towards electrocatalytic aerobic oxidations of organic substrates

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The development of efficient, selective and non-noble metal based catalysts allowing the use of O₂ under mild conditions instead of harmful oxidants or energy costly methods is a crucial issue in the oxidation of organic molecules.¹ In this context, taking inspiration from Nature, we aim at reproducing activities of metalloenzymes of the oxygenase/halogenase family which are able to perform oxidation/halogenation reactions efficiently and selectively under mild conditions, through the reductive activation of O₂.² Our original strategy focuses on complementary electrochemical and spectroscopic approaches to study the activation of O₂ by Fe and Mn porphyrins in order to ultimately develop electrosynthetic processes for the oxygenation or halogenation of a series of substrates under homogeneous conditions.³,⁴

We will illustrate our work with recent studies of O₂ reductive activation using Mn or Fe complexes using cyclic voltammetry and spectroelectrochemistry and present promising results of electrocatalysis experiments towards oxidation of substrates.⁵