

Electrochemically Driven Redox Catalysis – Applications in the Water Splitting Reaction and Organic Synthesis

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Proton-coupled Electron transfer reactions (PCET) are essential for a wide range of energy conversion reactions such as water splitting or CO₂ reduction.¹ In fact, electrons, holes, and protons are basically the energy carrier in sustainable fuel cycles. Thus, metal complexes with proton responsive ligands have been investigated as catalysts in such reactions and they proved to be very beneficial since they can mediate proton *and* electron transfer processes.^{1,2} In the first part of the talk I will focus on the application of metal complexes with proton responsive entities in the water splitting reaction (Figure 1). The studies highlight the importance of PCET steps during catalysis on the complex stability, overpotential and reaction rate.³

In the second part of the talk a detailed kinetic and thermodynamic analysis of the anodic allylic esterification of alkenes as well as the application of the anodic amination and esterification of non-activated alkenes catalysed by diselenides will be presented.⁴ Amination and esterification reactions are of considerable importance since C–N and C–O bond motifs can be found in numerous organic compounds associated with biological, pharmaceutical, or material scientific applications. Cyclic voltammetry is used as a powerful tool to examine the mechanism of the electrochemically driven C–O bond formation.

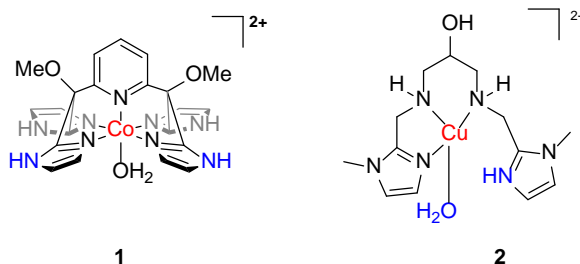


Figure 1. Representative examples of metal complexes with proton responsive ligands.

References

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