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PREPARATION AND CHARACTERIZATION OF COBALT SUBSTITUTED GLOBINS

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Over the last few years, cobalt coordination compounds have been widely studied as catalysts for the production of green hydrogen by water electrolysis[1]. However, these compounds present some drawbacks like their low water solubility. As a consequence, cobalt coordination compounds have been embedded into protein scaffolds as non-native cofactor to solve these problems and improve the efficiency[2].
In this context, we have substituted the natural heme*b* group of two proteins belonging to the class of globins (myoglobin and neuroglobin) with Co(III)-protoporphyrin IX to obtain the corresponding Co-adducts, whose reactivity was studied with a combination of spectroscopic (UV-Vis, MCD and fluorescence) and electrochemical techniques.
We found that replacement of the heme group with Co(III)-protoporphyrin IX does not significantly influence the three-dimensional structure of both proteins. UV-Vis and MCD spectra demonstrate that the Co-derivatives of myoglobin and neuroglobin invariably contain a low spin, octahedral Co^{3+} ion, regardless the nature of the axial distal ligand[3].

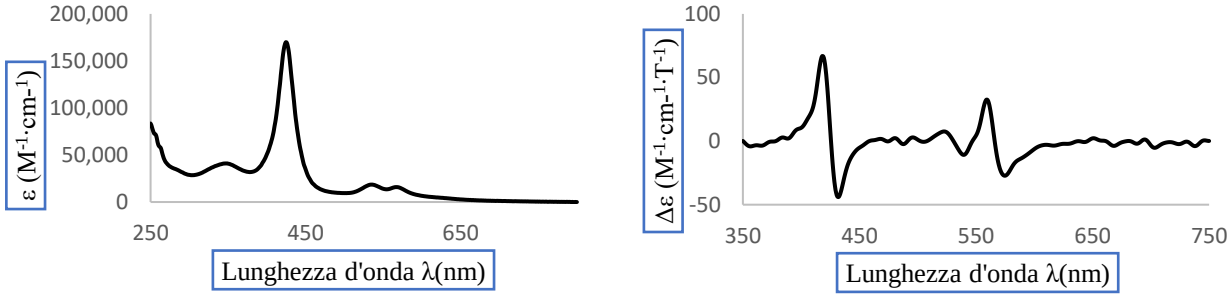

Figure 1: *Electronic (left) and MCD (right) spectra of Co^{3+}-HMbWt at pH = 7.0.*

Using cyclic and square wave voltammetry, we have been able to study the redox properties of Co(III)/Co(II) couple inside the proteins, determining its thermodynamic and kinetic behaviour.

[1] M. Bacchi et al. *Inorganic Chemistry "Cobaloxime-Based Artificial Hydrogenases"* **2014***53* 8071- 8082.
[2] A. Onoda and T. Hayashi *Current Opinion in Chemical Biology* "*Artificial hydrogenase: biomimetic approaches controlling active molecular catalysts"* **2015***25* 133-140.
[3] S. Neya et al. *Inorganic Chemistry "Relaxation Analysis of Ligand Binding to the Myoglobin Reconstituted with Cobaltic Heme"* **2013***52* 7387-7393.