

## ADVANCED CU-PEPTIDE DESIGN FOR THE EFFICIENT ELECTROCATALYTIC PRODUCTION OF O<sub>2</sub>

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Converting renewable electric power into H<sub>2</sub> by the electrolysis of water represents a reasonable alternative for the continuation of the flexible supply of our needs now tuned towards renewable energy sources. Catalysts for the electrolysis of water (e.g., H<sub>2</sub> production) that utilize first row transition metals, especially those which promote the more demanding oxygen evolving reaction (OER, also known as water oxidation catalysts, WOCs), are highly wanted. Despite the direct advantages of heterogeneous systems, molecular WOCs formed with organic ligands gain peculiar attention. Molecular systems can either change dynamically leading to *in-situ* formed compounds with characteristic activity, or exhibit remarkably long-lived molecular catalysis. Investigation and understanding of the pH-dependent behavior, stability and redox properties of the various metal–ligand combinations ought to be continual goals in accordance with their central role in both scenarios. We are studying versatile metallopeptides, paying special attention to copper. These systems are inspired by the natural polypeptides serving as the backbone of most metalloenzymes. My presentation focuses on new metal coordination options created by artificial peptide branching. We achieved substantial progress in the control of the stability and WOC performance of copper-branched peptide complexes.<sup>[1-3]</sup> Moreover, the molecular catalysts could be layered onto electrodes with polyelectrolytes that allowed *operando* surface studies.<sup>[4]</sup> Most recently we have achieved an order of magnitude increase in the catalytic rate for WOC by introducing  $\alpha$ -methyl substituents to a branched peptide backbone (*to be submitted*). The key to all targeted modifications was the modular design of this new ligand family.<sup>[5]</sup>

### References:

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