



Bioelectrochemistry and electrocatalysis for energy conversion

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Abstract: The conversion of solar energy into chemical bonds as well as the utilization of energy stored in chemical bonds requires an in-depth understanding of bioelectrocatalytic and electrocatalytic reactions. In addition to the design of novel catalysts for oxygen reduction and oxygen evolution as the limiting reactions in electrolyzers and fuel cells, development of optimized high-surface area electrode materials, immobilization of catalysts on the electrode surface as well as the development of analytical techniques is of utmost importance. Moreover, for the design of biofuel cells or biobatteries based on biocatalysts entrapped within specifically designed redox polymers, the adaptation of the redox potential of the polymer bound redox species to the formal potential of the prosthetic group in the active site of the enzyme is of high importance. The following aspects will be discussed:

1. Principles of mediated electron transfer using redox polymers and design of biofuel cells and photobioelectrochemical energy harvesting devices
2. Design of photobioelectrochemical devices based on PS1 and PS2
3. Integration of hydrogenases into specifically designed redox polymers
4. Development of noble-metal free electrocatalysts for oxygen reduction and oxygen evolution reactions
5. Determination of the onset potential of gas evolution processes

Acknowledgement:

I am grateful for the contributions of all students, postdocs and cooperation partners over the past years, who in the one or other way contributed to this field of research, specifically to Dr. Thomas Erichsen, Dr. Sascha Pöller, Dr. Dmitrii A. Guschin, Dr. Yvonne Beyl, Dr. Michaela Nebel, Dr. Aleksandar Zeradjanin, Dr. Andrea Puschhof, Dr. Edgar Ventosa, Dr. Artjom Maljusich, Dr. Rosalba Rincon, Ms. Giorgia Zampardi, Dr. Justus Masa, Ms. Piyanut Pinyou, Ms. Jeevanthi Vivekananthan, Mr. Kirill Sliozberg, Ms. Fangyuan Zhao, Dr. Minling Shao, Dr. Xingxing Chen, Dr. Thara Chikka Nagaiah, Mr. Jakub Tymoczko, Dr. Volodymyr Kusnetzov, Dr. Edyta Madej, Dr. Stefan Klink, Dr. Kathrin Eckhard, Dr. Mathieu Etienne, Dr. Bernardo Ballesteros Katemann, Dr. Sebastian Neugebauer as well as cooperation with Prof. Martin Muhler, Dr. Wei Xia (Industrial Chemistry, Bochum, Germany), Dr. N. Plumeré, Dr. Aliaksandr Bandarenka, Dr. Fabio La Mantia, (CES, Bochum, Germany), Mr. Volker Hartmann, Mr. Tim Kothe, Dr. Adrian Badura, Prof. Matthias Rögner (Plant Biochemistry, Bochum, Germany), Dr. Roland Ludwig (Boku, Vienna), Prof. Lo Gorton (Lund, Sweden), Prof. Sergey. Shleev (Malmö, Sweden), Prof. Donal Leech (Galway, Ireland), Mr. Alaa Alsheik Ougli, Dr. Olaf Rüdiger, Prof. Wolfgang Lubitz (MPI-CEC, Mülheim, Germany).

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