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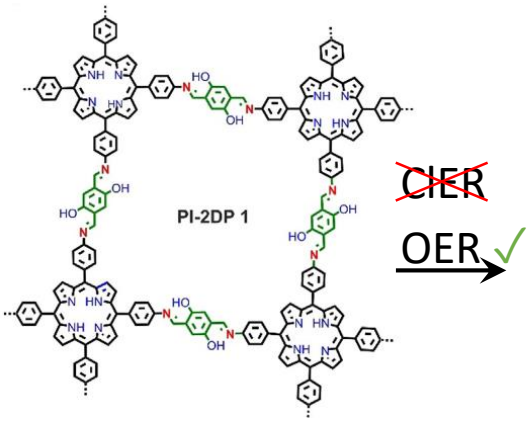
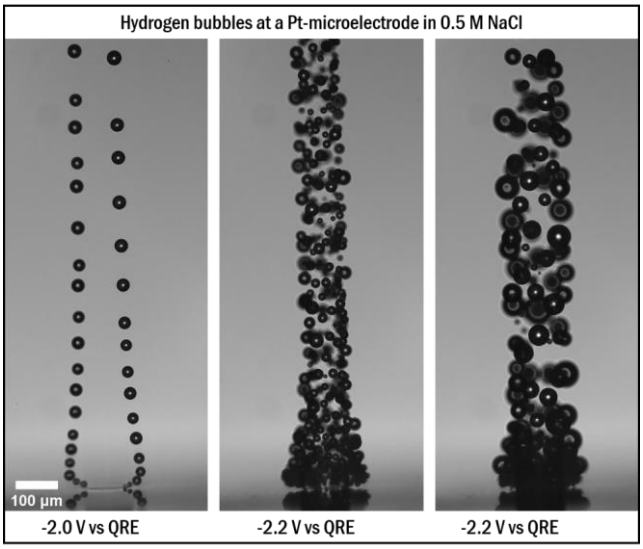
Experimental investigation of OER selectivity and bubble dynamics with using COF coated electrodes in sea water electrolysis
studentische Hilfskraft

As a possible storage for surplus renewable energy, hydrogen as a chemical energy carrier has high potential due to its emission-free, electrolytic production. However, current water electrolysis technologies have low tolerance to impurities and use high purity water to protect sensitive components such as the electrocatalysts. With the development of more robust electrodes, there is increasing opportunity to use the vast amounts of worldwide available seawater as an electrolyte to store surplus energy generated in marine environments close to the source. The anode reaction during the splitting of sea water can, next to the wanted oxygen evoution reaction (OER), also be the undesirable chlorine evolution reaction (ClER) whose products are corrosive to the most anode materials. Using two-dimensional covalent-organic frameworks (COF) as protective coatings during the electrolysis, the robustness of the electrodes can be enhanced by increasing the selectivity for a desired reaction in presence of harmful ionic species.

To improve the efficiency of the electrolysis process, the dynamics of the gas bubbles generated on the electrocatalysts surface can be modified, since bubbles adhering to the electrodes block possible nucleation centres as well as the current flow.





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DRESDEN concept
Exzellenz aus Wissenschaft und Kultur

The aim of the work is the selectivity evaluation of COF-coated electrodes towards the OER during the sea water electrolysis with analytical chemistry techniques and electrochemical methods.
Thereafter, the dynamics of oxygen/hydrogen bubbles are to be investigated at COF-coated and uncoated microelectrodes. For this purpose, high-speed cameras as well as existing image processing algorithms can be used.

Work:

- Selectivity measurements with coated and uncoated electrodes using techniques of analytical chemistry and electrochemistry
- Experimental investigation of bubble dynamics in sea water at coated and uncoated microelectrodes
- Analysis using image analysis techniques

Requirements:

- Study in chemistry, chemical engineering, process engineering (or comparative field of study)
- Interest in experimental work

Conditions:

- Duration: min. 5 months
- Possible start: 01.10.2024
- Workplace: TU Dresden