

Photoelectrochemical water splitting – optimization of operating conditions to enhance TiO_2 photoanodes performance

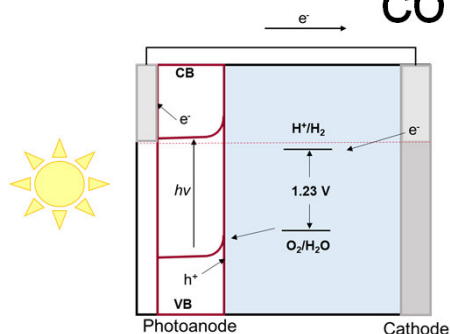


Figure 1: Scheme of PEC water splitting with a photoanode and a dark cathode.

Source: Hisatomi, T.; Kubota, J.; Domen, K. Recent advances in semiconductors for photocatalytic and photoelectrochemical water splitting. *Chemical Society reviews* 2014, 43 (22), 7520–7535. DOI: 10.1039/c3cs60378d.



Figure 2: Testing facility for PEC water splitting at HyCentA

Description:

Photoelectrochemical (PEC) water splitting is a promising approach for sustainable hydrogen production using sunlight as the sole energy source. Upon numerous semiconductor materials, TiO_2 is extensively studied due to its high stability. However, it suffers from low activity in the visible light range. For that reason, addition of dopants could shift the absorption into the visible light and enhance the overall efficiency of the system. Furthermore, operating at elevated pressure, temperature and concentrated sunlight could further improve the hydrogen production rate and overall efficiency.

The aim of this thesis is to develop a suitable testing procedure for electrochemical characterization of various photoelectrodes based on TiO_2 . The testing will be done in an advanced testing facility allowing precise control of light intensity, pressure and temperature. The tests include screening of selected photoanodes under variable operation conditions and evaluation of its influence on the systems stability and efficiency.

Content:

- Literature research on PEC water splitting and electrochemical characterization techniques (1 month)
- Developing a testing procedure with a benchmark photoanode at the test rig (1 month)
- Photoelectrochemical characterization of selected photoanodes, optimization of operating parameter at and performance evaluation (3 months)
- Thesis writing (1 month)

Start: Any time

Duration: approx. 6 months

Paid Master Thesis

Contact: DI Sara Kurakin, kurakin@hycenta.at

DI Dr.techn. Marie Macherhammer, +43 (316) 873-9521, macherhammer@hycenta.at

