



## Bachelor Thesis

# Hydrogen from photo-catalytic water splitting process – Technologies, Potentials, Costs

The debate on hydrogen as a clean energy carrier to decarbonize processes, which are hard to be electrified, strongly focuses on the production technology of water electrolysis in Germany. However, hydrogen produced from photo-catalytic processes can represent a so far less considered alternative to supply net carbon-free hydrogen.

Photo-catalytic processes utilize solar energy in a chemical conversion to produce hydrogen directly, in a photovoltaic cell for example. A very wide spectrum of incident sunlight can be absorbed, which can be an advantage over the electricity-intensive production of hydrogen from water electrolysis. To develop the technology to commercial readiness, the key question is the various material compositions of the catalyst, which has been a hurdle to date.

## Key tasks and objectives of the thesis

- Detailed familiarization with photo-catalytic hydrogen production and alternative processes to produce hydrogen
- Review of the theoretical and empirical literature on the current state of photo-catalytic processes for hydrogen production
- Evaluation of their costs, potentials, benefits, and caveats
- Techno-economic comparison of performance with alternative production processes

## Your profile

- Student of economics, best with focus on energy
- Interest in techno-economic topics, hydrogen, energy transition

## Literature

- Ahmad et al. (2015). "Hydrogen from photo-catalytic water splitting process: A review". In: Renewable and Sustainable Energy Reviews, 599-610
- Maurya et al. (2023). "The development of techno-economic assessment models for hydrogen production via photocatalytic water splitting". In: Energy Conversion and Management, Volume 279

## Contact



**Jan Hendrik Kopp**

Tel.: +49 (0)221 650 745-33

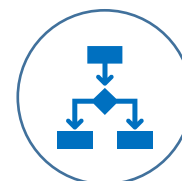
E-Mail: jan.kopp@ewi.uni-koeln.de

## Topics



- Hydrogen
- Energy Transition

## Methods



- Levelised Cost of Hydrogen
- Literature work