

## Offer Student Work - Bachelor / Master Thesis

### Development of High-Entropy Alloy Coatings for Metallic Bipolar Plates in PEM Water Electrolyzers

#### Task description

Hydrogen produced by Proton Exchange Membrane Water Electrolyzers (PEMWEs) is considered one of the key technologies for achieving a sustainable and carbon-neutral energy future. Metallic bipolar plates are among the most critical stack components, where excellent corrosion resistance, high electrical conductivity, and long-term durability are required under highly aggressive operating conditions. Advanced high-entropy alloy (HEA) coatings have recently emerged as promising candidates to overcome the limitations of conventional coating materials and improve the performance and lifetime of metallic bipolar plates.

The proposed research aims to investigate the development of HEA coatings on stainless-steel substrates using advanced Physical Vapor Deposition (PVD) technologies. Different substrate surface conditions and processing approaches will be explored to understand their influence on the coating characteristics and functional performance. The developed coatings will be comprehensively evaluated using microstructural, spectroscopic, electrochemical, electrical, and mechanical characterization to assess their suitability for next-generation hydrogen technologies.

#### The work program includes

- Literature review on metallic bipolar plates, HEA coatings, and hydrogen technologies
- Design and execution of coating experiments using PVD technologies
- Preparation of metallic substrates and coating process optimization
- Microstructural, spectroscopic, electrochemical, electrical, and mechanical characterization of coated samples
- Evaluation and interpretation of experimental data
- Documentation and presentation of the research outcomes

#### Requirements

University student (m/f/d) from the field of Mechanical Engineering, Materials Science, Nanotechnology, Physics, Chemistry, or a related discipline.

- Basic knowledge of materials science and surface engineering is desirable
- Interest in advanced coating technologies, materials characterization, and hydrogen technologies
- Self-motivated with enthusiasm for experimental research
- Good English language skills (written and spoken)

If interested, kindly forward your complete application (**CV and grade sheets**) as a single PDF to the email:

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