

Paid Master Thesis in H₂ Technologies: State-of-Health and 2nd-Life Potential of PEM Electrolyser Components

Task Description:

Proton exchange membrane electrolyzers (PEMEL) are considered a cornerstone of green hydrogen production due to their high efficiency, dynamic operability, and compatibility with renewable electricity sources. However, despite growing deployment, the long-term performance and recyclability of key electrolyser components remain insufficiently understood. Currently, end-of-life (EoL) is typically defined at the cell or stack level, yet standardized criteria for individual components are lacking (see **Fig. 1**). To establish circular system designs, a deeper understanding of component-specific degradation and state-of-health indicators as a foundation for defining EoL at the component level is needed.

This thesis aims to experimentally assess degradation patterns and performance losses of key electrolyser components, such as the porous transport layer (PTL) and bipolar plate (BPP). This will help define component-specific EoL criteria and 2nd-life strategies, supporting the development of circular and resource-efficient electrolyser system designs.

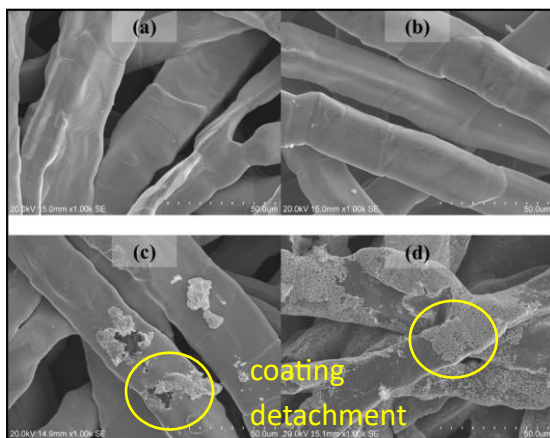


Fig. 1: Scanning electron microscopy (SEM) images of porous transport layers (a,b) before and (c,d) after chronoamperometry; picture taken from Moradizadeh et al. *IJHE* **2024**, <https://doi.org/10.1016/j.ijhydene.2024.11.192>

Content / Time table:

- Literature review to identify degradation mechanisms of PTLs and BPPs. (1 month)
- Characterize PTLs and BPPs to establish baseline material properties. (1 month)
- Analyse PTLs and BPPs at or near end-of-life (EoL) and define component-based EoL criteria. (2 months)
- Assess potential 2nd-life application scenarios for EoL components. (1 month)
- Evaluate results and thesis writing. (1 month)

Start: as of now

Duration: approx. 6 months

Paid Master Thesis

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