Experimental data acquisition as a basis for the sustainability assessment of AEMWE

Description:

In order to produce renewable hydrogen efficiently and sustainably, advanced electrolysis technologies are required that combine high performance with low material and manufacturing costs. Anion exchange membrane water electrolysis (AEMWE) represents a promising alternative to conventional alkaline and PEM (proton exchange membrane) electrolysis by enabling high efficiency, compact system design, and the use of PFAS-free and PGM-free materials.

However, to fully exploit the potential of AEM electrolysis for large-scale hydrogen production, a detailed understanding of the materials, manufacturing processes, and electrochemical behavior of the individual components is essential. Within the framework of the project *ELYSIUM – AEM-Electrolysis: Scaling, Integration, Utilization, and Manufacturing*, the focus of this thesis is the experimental characterization and analysis of AEM electrolysis components.

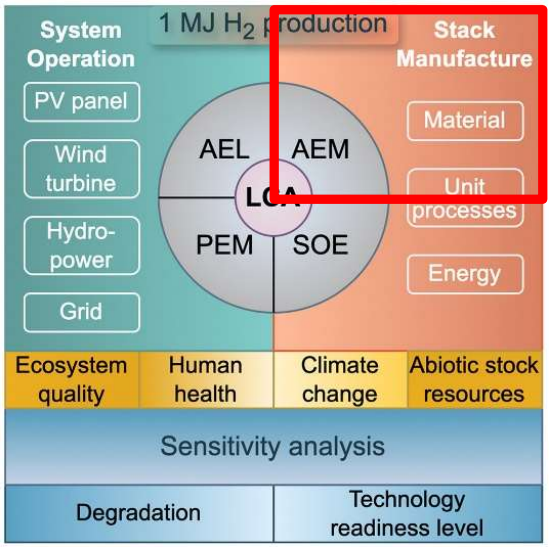

Figure 1: Overview of LCA data categories. Stack and module (red frame) are scope of the thesis (Source: Wei, Joule, 8(12), 3347)

The thesis aims to collect essential information on state-of-the-art AEM electrolysis systems to serve as input for a Life Cycle Assessment (LCA) performed by a project partner. The work involves the disassembly and detailed documentation of modules and system elements (stack level), the analysis of materials and manufacturing processes, and the electrochemical characterization of single-cell components. The electrochemical studies will be conducted at an AEM single-cell test station, including the recording of current-voltage (I–V) characteristics and, where appropriate, electrochemical impedance spectroscopy. The experimental results will be evaluated and compared with the product targets of the project, with particular emphasis on the development of a PFAS-free and PGM-free AEM electrolysis technology.

Content:

- Literature research on AEMWE and state-of-the-art material selection (1 month)
- Experimental data acquisition for state-of-the-art AEMWE system (3 months)
- Data evaluation and interpretation (1 month)
- Thesis writing (1 month)

Start: Any time
Duration: approx. 6 months
Paid Master Thesis
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