

Master's Thesis: Replacement and Performance Analysis of the AEM Electrolysis with other Electrode Material

Fuels are essential for meeting energy demands. As a fuel, hydrogen is a viable option, but it necessitates significant changes to the present system. In addition to the system conversion, the creation of hydrogen is a significant factor in meeting the demands. With Russia's natural gas cut off, the need of energy self-sufficiency has been an important agenda for the EU additionally, it will contribute to the carbon neutrality goal of 2050.

Harnessing hydrogen is been done from a long time, but the methods are harming the nature and that can be changed by choosing the method of electrolysis for the production instead of Steam Reforming method. Production of Green Hydrogen will reduce the impact significantly. There are numerous electrolysis techniques, such as Proton Exchange Membrane Electrolysis (PEM) and Anion Exchange Membrane Electrolysis (AEM).

The PEM Method was created about 1960 and is now nearing maturity, whereas the AEM is quite young and requires more investigation. The primary benefit of AEM over PEM is that it does not need Critical Raw Materials (CRMs). The thesis will explore the effect of changing the electrode from the commonly used Nickel Based to another metal that are abundant in Europe on the generation of Hydrogen in comparison to the original Nickel Based output. Furthermore, the thesis will explore the change in output under various variable situations such as current, voltage, and so on.

The following tasks will be allocated to the Thesis:

- 1) AEM technology literature review
- 2) Investigating metal availability in Europe.
- 3) Electrode and membrane evaluation.
- 4) If manufacturing of electrode is required, then method and process like sputtering and deposition system will be utilized or the market survey needs to be done for the procurement of the electrode.
- 5) Life Cycle Analysis (LCA) of the electrode and Membrane.
- 6) Test the arrangement through its trials under various conditions.
- 7) Evaluate the experiment's dataset and prepare a conclusive report showing the influence on Hydrogen production.

For the experiment, the testing setup and location will be finalized based on the availability of the equipment and availability of the expert in the topic.

Masters Project:

Literature Review of Anion Exchange Membrane (AEM) Technology

Masters Project will include Literature Review of AEM Technology and the equipment's needed for the testing and experimenting the AEM Technology.

Time Frame:

Feb 2023 – July 2023

University Supervisor:

Dr. Christina Toigo

Contact Person: (Centre for Sustainability)

Dr. Elise Blondel

Contact Person: (Airbus Defence and Space)

Dr. Matthias Geistbeck