DEGRADATION ANALYSIS OF ANION EXCHANGE MEMBRANE ELECTROLYSER

Anion exchange membrane water electrolysers (AEMWE) represent a groundbreaking emerging technology that holds the promise of supplanting proton exchange membrane electrolyers (PEMWE). Electrolysers use water to produce green hydrogen by consuming electricity. Unlike PEMWE, which relies on precious metals like Pt and Ir, AEMWE utilizes more readily available Ni and Fe-based catalysts.

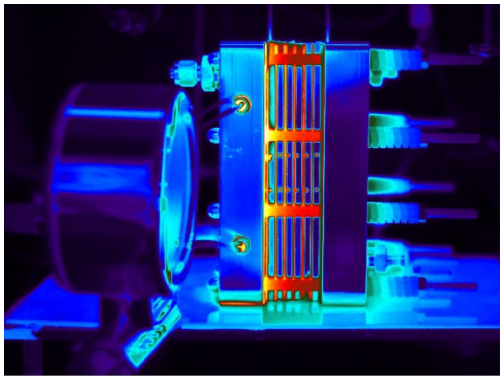

Figure 1:Representative thermographic picture of the developed AEMWE stack.

The primary distinction between PEMWE and AEMWE in terms of liquid electrolyte lies in the use of pure water in the PEMWE system, whereas the AEMWE system requires an aqueous KOH solution. Adding KOH salt to the solution is essential for AEMWE to achieve performance levels comparable to those of PEMWE.

Electrochemical Impedance Spectroscopy (EIS) is one of the techniques used to monitor the performance and degradation of electrolysers. The catalyst, as well as membrane degradation, could be studied with this simple nondestructive test. Furthermore, gas crossover testing will be performed every 100 hours using a micro GC. The initial few weeks would be spent understanding and optimizing the existing electrolyser system.

The master thesis will aim to determine the degradation rate of the existing AEMWE stack through repeated EIS measurements. The following measurement criteria will be implemented and analyzed through the combination of EIS-DRT. Data processing must be done in parallel.

Parameter	**Conditions**	**Comments**
Time	1000 h	Extendable up to 2000 hours
Temperature and pH	60 °C; 1M KOH	
EIS testing	Every 100 hours	Pseudo-galvanostatic; Bias: 0.1, 0.4, 0.7 A cm^{-2}; Amplitude = 5mV
AEM	X37-50RT	Commercial
HER-Substrate	Raney Ni-Ni Felt	
OER-Substrate	$NiFe_2O_4$-SS316L Felt	
Gas Crossover	Every 100 hours	Using MicroGC

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