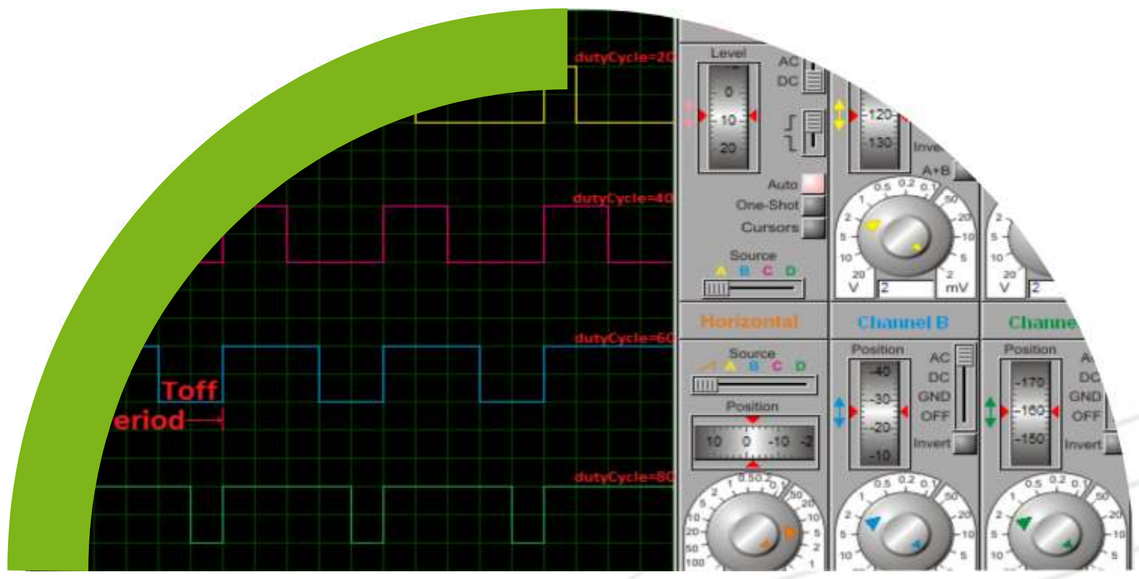
UNIVERSITY OF ZAGREB
FACULTY OF CHEMICAL
ENGINEERING AND TECHNOLOGY

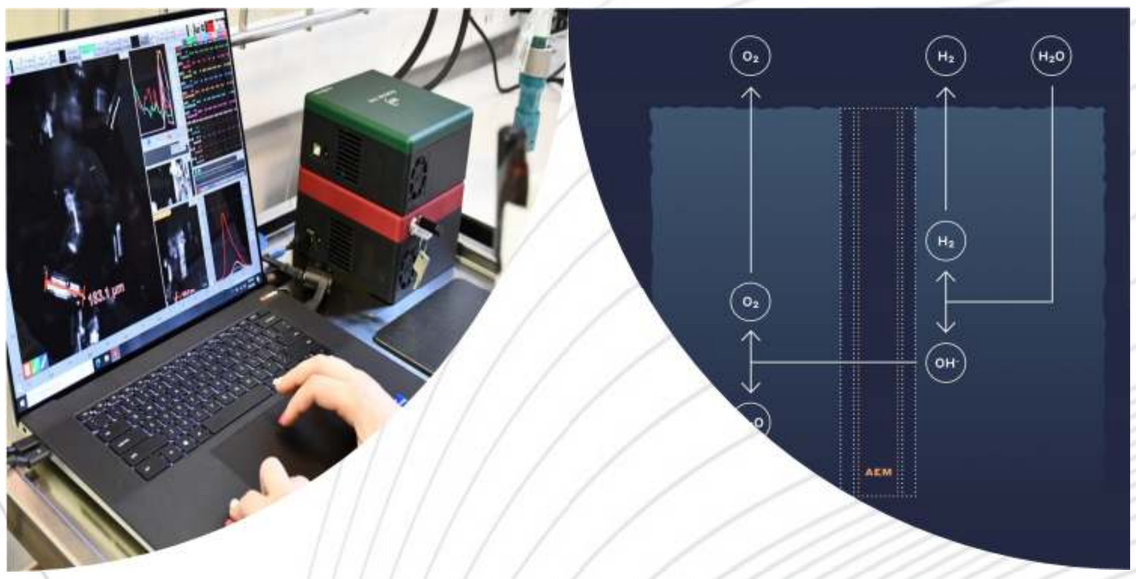
FKITMCMXIX

LAM
LABORATORY FOR AUTOMATION & MEASUREMENT

Designing of lab-scaled system for green hydrogen production based on AEM water electrolysis



Authors: Srečko Herceg[1],
Nenad Bolf[1],
Danijel Krznar[2],
Željka Ujević Andrijić[1],
Matea Gavran[1],
Marko Sejdić[1]



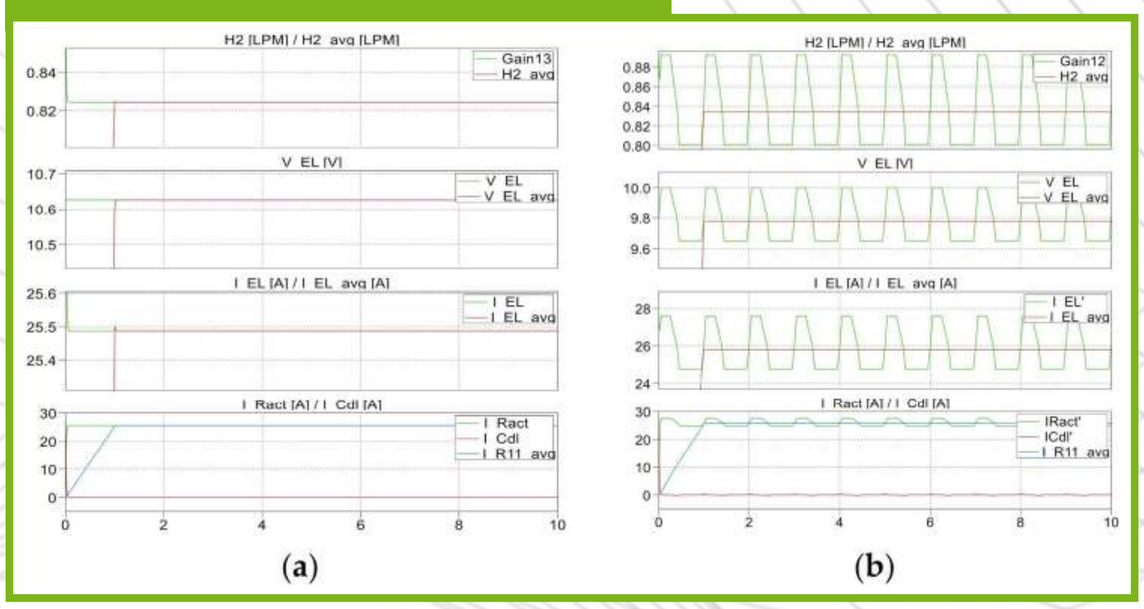
Problem & objectives

- Enable inexpensive production of large amounts of hydrogen
- Use of non-noble metal electrocatalysts
- More efficient hydrogen production

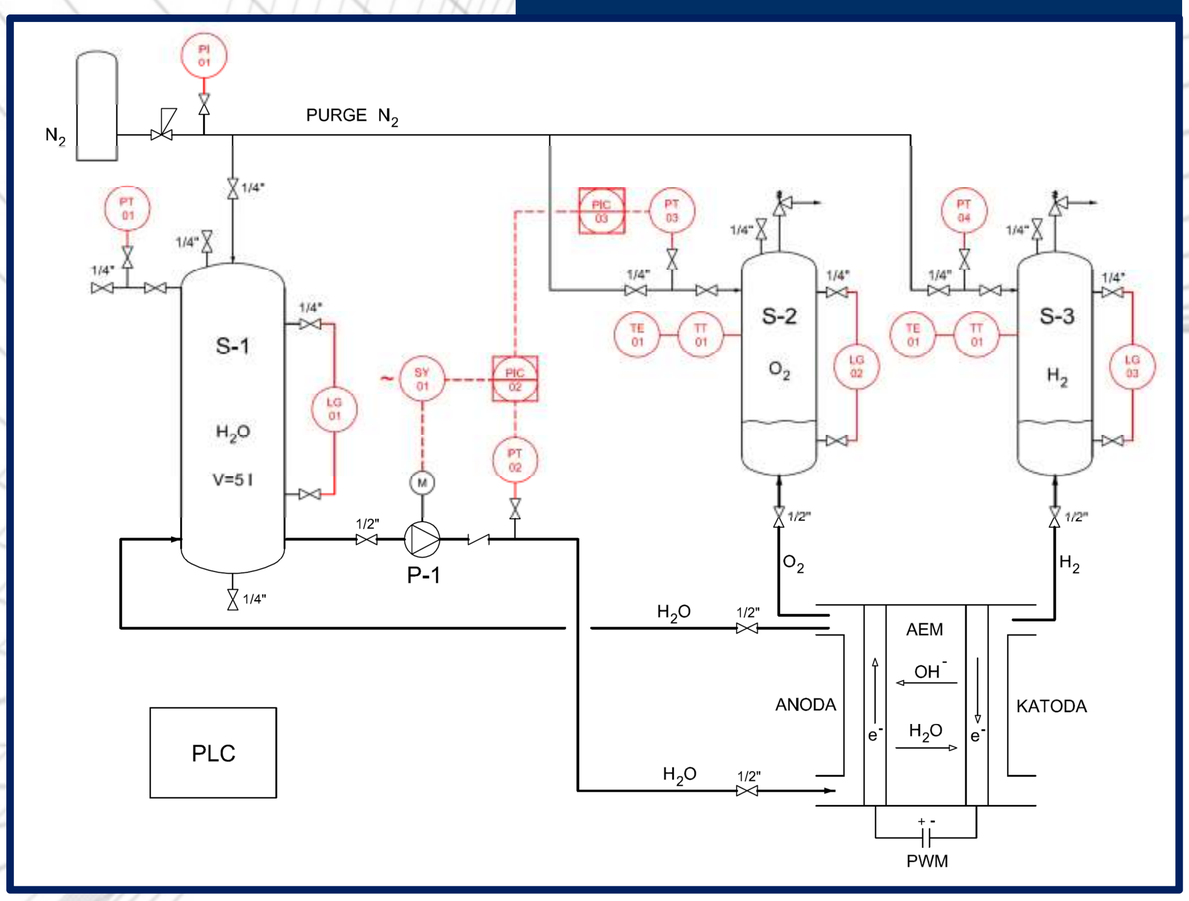
Strategy and methods

- Designing of the lab-scaled AEM water electrolysis system
- Modulation of DC power source signal using pulse-width modulation (PWM) technique
- Combining the width of the square-shaped formed signal, frequency and other operating parameters

DC vs PWM

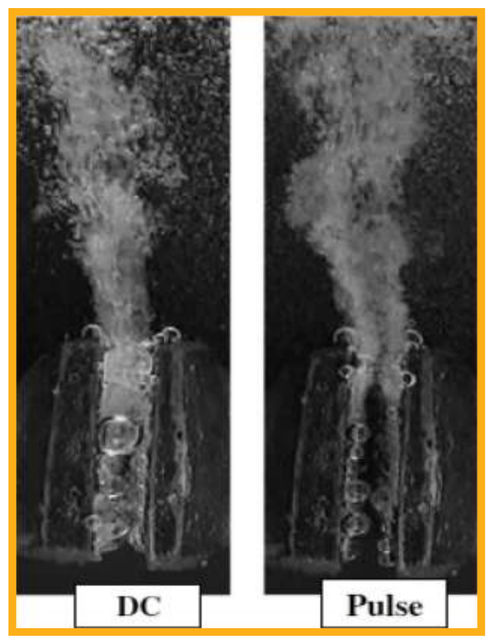


AEM lab system



CONCLUSION

- An AEM electrolysis solution combines the benefits of PEM and alkaline systems by allowing the use of non-noble catalysts while achieving energy densities and efficiencies comparable to PEM technology.
- The application of pulses is a promising method to enhance the efficiency of water electrolysis
- Through optimal lab design additional production efficiency can be achieved



1. University of Zagreb, Faculty of Chemical Engineering and Technology, Department of Measurements and Process Control, Savska cesta 16/5a, 10 000 Zagreb, Croatia
2. Automation Design Solutions ltd., Vladka Mačeka 5, 10 430 Samobor, Croatia

References:
Kim, J.-H.; Oh, C.-Y.; Kim, K.-R.; Lee, J.-P.; Kim, T.-J., Electrical Double Layer Mechanism, Analysis of PEMWater Electrolysis for Frequency Limitation of Pulsed Currents. Energies 2021, 14, 7822.
https://doi.org/10.3390/en14227822
F. Rocha, Q. de Radiguès, G. Thunis, J. Proost, Pulsed water electrolysis: A review, Electrochimica Acta 377 (2021) 138052
https://doi.org/10.1016/j.electacta.2021.138052