LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

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« Ultrasonic-assisted electrolysis on PEM single-cell: Practical tests »

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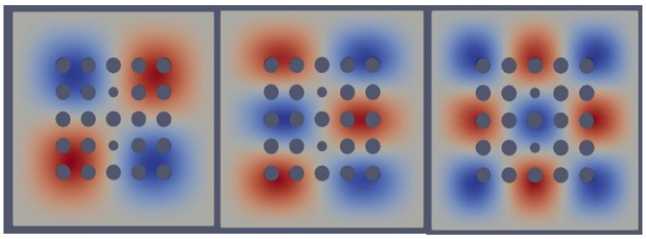
Context

Renewable hydrogen is essential for decarbonizing hard-to-abate sectors, but water electrolysis remains costly and energy intensive. Ultrasonic vibrations can improve mass transport and bubble removal, yet their benefits are often offset by actuator power consumption. This project investigates closed-loop piezoelectric vibration control to enhance electrolysis efficiency with minimal additional energy input.

Objective

FEM Ultrasonic plate modes in constrained conditions



Cartography test bench

- Exploit and extend results from previous studies to excite ultrasonic vibrational modes of electrolyzer plates within a realistic cell enclosure.
- Develop a dedicated experimental test bench to quantify performance improvements under a range of operating conditions. Evaluate the trade-off between enhanced hydrogen production and the energy required for vibration actuation.

The main challenges of this project include achieving effective ultrasonic excitation within the constrained electrolyzer environment and limited actuator space, minimizing actuation energy while maintaining performance gains, and accurately assessing net efficiency by accounting for both hydrogen production improvements and actuator power consumption.

Key word

Ultrasound-assisted electrolysis, piezoelectric control, ultrasonic vibration, PEM electrolysis

References

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