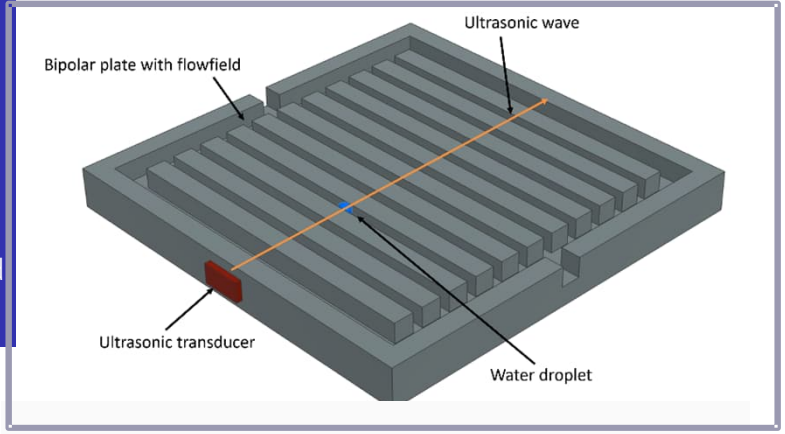
Tangential ultrasonic coupling with PWAS on a bipolar plate

Spatially resolved, minimally invasive in-situ detection of liquid water in the flow field of a bipolar plate



STATUS QUO

Water management is crucial for the performance and safety of a fuel cell. Condensed water can block channels and lead to cell failure. In situ measurements to diagnose such blockages are a challenge due to poor accessibility to the process. Previous measurement methods are costly or disrupt the process. They cannot be used in dynamic operation or on the full-stack system.

OUR TECHNOLOGY

We have developed a compact, cost-effective ultrasonic sensor system that can also be attached to the edges of narrow bipolar plates. The non-invasive acoustic interaction between the water and the plate enables a reliable detection of the droplet positions and sizes. In addition, this technology can also be used in full-stack systems for real operation diagnostics.

BENEFITS

- ▶ In-situ process monitoring
- ▶ Spatial resolution of the droplet position
- ▶ Compact and cost-effective sensor system
- ▶ Scalable, non-invasive sensor technology

APPLICATION POSSIBILITIES

This approach provides the basis for the development of a cost-efficient monitoring system for the fuel cell. The compactness of the sensor technology also opens up the potential for measurements in real operation.

COMMERCIALIZATION OPPORTUNITIES

There are various possibilities for cooperation between the industrial partner and TU Darmstadt: from an exchange with the know-how carriers of the technology up to a close cooperation in case of further development needs. The technology is protected by intellectual property rights and can be used by the industry partner after a sale or licensing agreement.

CURRENT STAGE OF DEVELOPMENT TECHNOLOGY READINESS LEVEL (TRL)

9	Product ready to launch
8	
7	Prototype
6	
5	
4	
3	Proof of Concept
2	
1	Idea

The technology development is at Level 3: The applicability was successfully tested in the laboratory on a single bipolar plate.

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