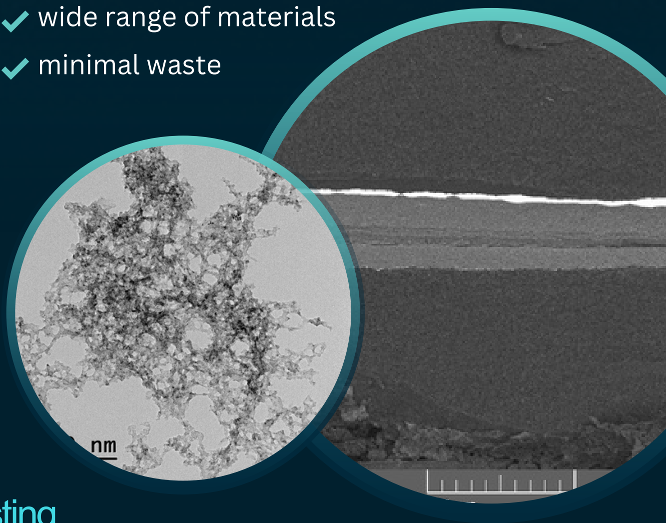
Spark ablation: A route to optimized catalyst layers for hydrogen applications

What we do

We synthesize nanomaterials via spark ablation, an environmentally friendly and versatile technique that uses high-energy electrical discharges to generate nanoparticles directly in the gas phase with precise control over their size and composition. Our sophisticated spark ablation system features a high-frequency pulsed power supply and a motorized electrode actuator, enabling precise control over spark parameters and consistent nanoparticle production. Our system enables high production rates with minimal waste. Collecting nanoparticles by electrostatic precipitation and direct filtration allows us to produce diverse nanomaterial functional layers for various applications.

Spark ablation

- versatile and eco-friendly
- precise control of spark parameters
- high nanoparticle production rates
- wide range of materials
- minimal waste



Catalyst layers

We specialize in directly depositing catalyst layers onto gas diffusion layers using spark-ablated nanoparticles. This enables precise platinum loading control, even at very low levels, while maintaining high deposition efficiency and high uniformity.

Fuel cell testing

We perform accelerated stress tests to evaluate the durability of catalysts and Membrane Electrode Assemblies (MEAs) and identify failure mechanisms . Our fuel cell test benches offer single cells (5, 25, 50 cm^2) and short stacks (up to 200W) measurements of constant loads, polarization curves, CV, LSV, ESCA and EIS, and are supported by ex-situ TEM/EDX and XRD characterization to study microstructural and compositional changes.

Areas of possible collaboration

We seek collaboration in the development of gas diffusion electrodes and MEAs for fuel cells and electrolyzers utilizing platinum-alloy nanomaterials synthesized by spark ablation. We offer to supply custom sized MEAs, with low platinum loading, tailored platinum-to-other metal composition, various platinum-to-carbon ratios. We offer to integrate our MEAs in partner fuel cell stacks or electrolyzer stacks or other niche applications (electrochemical compression, reversible fuel cells).

Laboratory of Hydrogen Technologies
https://www.it.cas.cz/en/d6/l063/
Contact: Dr. Tomáš Němec
nemec@it.cas.cz

INSTITUTE OF THERMOMECHANICS
Czech Academy of Sciences