

# Synthesis of nanomaterial by spark discharge for hydrogen technologies

## Development status

### Phase 2

**Feasibility study.** There is a realistic design of the technology and the initial tests in the laboratory are leading to the specification of the technology requirements and its capabilities.

## Challenge

Hydrogen fuel cells are expected to be widely used in the emerging hydrogen economy, in which hydrogen fuel cells are the energy source not only for cars, but may also serve as backup power units (e.g. in hospitals, telecommunications) or power small electronic devices. Fuel cells and electrolyser cells of the PEM type (with a polymer electrolytic membrane) are among the most promising. Our novel approach increases efficiency of these electrochemical devices and lowers associated manufacturing costs.

## IP protection status

National patent application (published in 2017) Two national utility models (submitted in 2020)

## Description

Innovative process for manufacturing and deposition of nanoparticles used for catalytic layers of a hydrogen fuel cell enhancing efficiency while significantly lowering the amount of associated waste products. The new method enables continuous production of nanoparticles by very fast repetition of the spark discharge. The gas stream carries the formed particles onto the functional layer, which can moreover be easily formed from more than one metal. The very small particle size makes it possible to reduce the amount of precious metal used while maintaining the necessary properties, which reduces costs. The currently used methods of nanoparticle preparation require vacuum and lengthy batch chemical preparation by wet process.

## Partnering strategy

*Collaboration, licensing*

## Institution



**The Institute of  
Thermomechanics, Czech  
Academy of Sciences**

## Commercial opportunity

PEM fuel cells for a broad range of applications (cars, backup power supplies, small electronic devices) as well as PEM electrolyzers (hydrogen production).