

Development of Fuel Cell Materials and Processes

The ENERMAT laboratory has been created in 2014 in the framework of a collaboration between the Karlsruhe Institute of Technology (KIT) and EIFER. It is located at the Institute for Chemical Technology and Polymer Chemistry (ITCP) at KIT Campus South.

Activities at ENERMAT:

- Promotion of EIFER's expertise in materials science and processes for energy, using conventional and less costly techniques such as screen-printing, and tape casting.
- Development of EDF patents linked to materials and processes before their exploitation phase.
- Evaluation of advanced materials for energy in strategic applications such as electricity production in fuel cell, electrochemical hydrogen production in electrolyzer, gas separation membrane and E-Fuels production.



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www.eifer.kit.edu/enermat-platform

www.itcp.kit.edu/deutschmann/download/ENERMAT.pdf



Samples produced in ENERMAT

From Powder to Power

Manufacturing of innovative powder-metallurgical processed materials, covering the whole production process, from the raw material to the finished product in 3 steps.

Powder Synthesis

- Solid-state reaction
- Pechini Process
- Sol-Gel Process

Powder Processing

- Pressing
- Screen-printing (5 to 40 μm)
- Tape-casting (20 to 2000 μm)
- Nano-Infiltration
- Sintering under air (1600°C)

Electrochemical Measurements

- Electrochemical Impedance Spectroscopy (EIS)
- Application profiles: power, temperature, reversibility, e-fuels
- Cell area from 3 to 50 cm^2 , pO_2 pH_2 PH_2O PNH_3 PCO_2
- Gas analysis, Microscopic Analysis



On-Going Public Funded Projects



KIT/CSM (DFG-NSF 2022 – 2025)

Electrochemically enhanced low-temperature catalytic NH_3 synthesis.



ECOMET (BMBF-NWO 2024 – 2028)

Efficient upgrading of CO_2 to methane using steam inside a protonic ceramic electrolysis cell.



HADES (ANR-BMBF 2024 – 2027)

Hydrogen through Ammonia Decomposition from Energy Storage.



PEPPER (EU 2025 – 2027)

Performant and Efficient Planar Proton-conducting Electrolysis Reactor.

References

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