ENERMAT PLATFORM

Materials Synthesis & Processes for Energy

European Institute for Energy Research by EDF and KIT

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 and hydrogen separation membrane.

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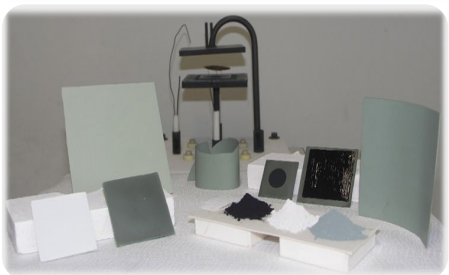
www.itcp.kit.edu/deutschmann/download/ENERMAT.pdf



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)
- Sintering under atmosphere (1000°C)

Electrochemical Measurements
- Electrochemical Impedance Spectroscopy (EIS)
- Application profiles: power, temperature and reversibility
- Cell area from 3 to 50 cm², pO_2 pH_2 PH_2O
- Microscopic Analysis

Public Funded Projects

CONDOR (ANR 2009 – 2011)
Protonic Ceramic Fuel Cell: Development, optimization and realization of advanced intermediate temperature protonic cells.

METPROCELL (EU 2012 – 2015)
Innovative fabrication routes and materials for metal and anode supported proton conducting fuel cells. http://www.metprocell.eu

OxiGEN (EU 2018 – 2020)
Next-generation Solid Oxide Fuel Cell stack and hot box solution for small stationary applications. http://www.oxigen-fch-project

MethQUEST (BMWi 2018 – 2021)
Production and use of methane from renewable sources in mobile and stationary applications. http://www.methquest.de

ARCADE (BMBF 2019 – 2022)
Advanced and Robust metal supported Cell with proton conducting ceramic for electrolysis Applications in Defossilized Energy systems.

References

Dailly, J., et al. (2017). **Long term testing of BCZY-based protonic ceramic fuel cell PCFC: Micro-generation profile and reversible production of hydrogen and electricity**. Solid State Ionics, 306, 69-75.

Dailly, J., et al., (2017). **High performing $BaCe_{0.8}Zr_{0.1}Y_{0.1}O_{3-\delta}$-$Sm_{0.5}Sr_{0.5}CoO_{3-\delta}$ based protonic ceramic fuel cell**. Journal of Power Sources, 361, 221-226.

Marrony, M., Dailly J. (2017). **Advanced Proton Conducting Ceramic Cell as Energy Storage Device**. Journal of The Electrochemical Society, 164, F988-F994.

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