



#InvestEUresearch

Horizon 2020 Work Programme for Research & Innovation 2018-2020

EMRS Event
Vienna, 29th October 2018

Workshop: Europe in Motion-EUMAT Session
Time: 14:00-18:00
Proponent: Gehrold (Bosch Corporate Research)
Proposal title: PEM FC Function-Design-Process

DG Research & Innovation

Research and
Innovation

PEMFC stack function and design Materials science for stack components

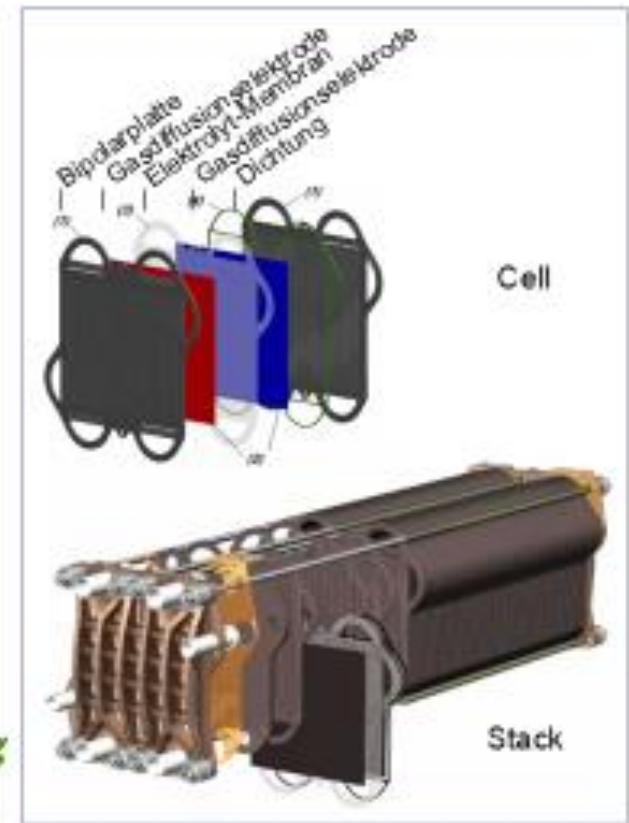
Stack consists mainly of MEAs and bipolar plates:

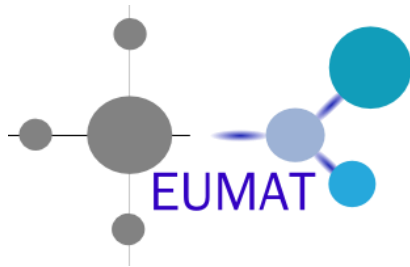
- ▶ Membrane-Electrode-Assembly (MEA)
 - ▶ Electrodes: Places of chemical reactions
 - ▶ Membrane: Proton transport, separation of reactants
 - ▶ Gas Diffusion Layers: Gas transport, water & heat management
- ▶ Bipolar Plates
 - ▶ Gas distribution, electric conductivity, cooling
- + Current collector, endplate, mechanical compression system

Cell design:

- ▶ Active area of cell defines electric stack current I
- ▶ Number of stacked cells defines voltage level of stack U
- ▶ Stack power $P = U * I$

All parts of stack have to be suitable for mass manufacturing





Project Targets

PEMFC Stack & MEA

Key Targets and Enabling Technologies

▶ Reduced Total Cost of Ownership

enabling materials and technology

▶ Stack Cost 20 €/kW @ 100,000 pieces

- Power density 2W/cm² @860mV
- Platinum loading per 0.1g/kW
- Production cost

thin membranes, cheap durable coating, low contact resistance, flow field
Pt-alloy catalyst for ORR, 3-4bar, reduce mass transport limitations
cycle times < 1s, less process steps, high degree of automatization

▶ Durability 6000h

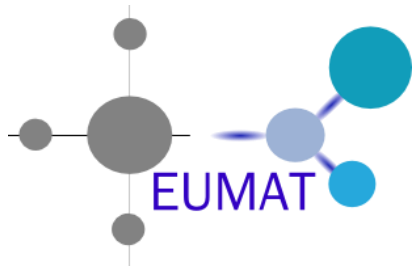
- Chemical membrane degradation: Radical Attack
- Mechanical membrane failure: creeping, hot spots, punctures
- Electrode: Carbon Corrosion, Platin dissolution

reduced metal ion load, polymer stability
reinforcements, MPL+GDL optimization
mitigation of fuel starvation, support free anode catalyst

▶ Simplified System architecture 50€/kW

- Operation temperature 105°C (reduced cooler size)
- Dry operation (no humidifier)

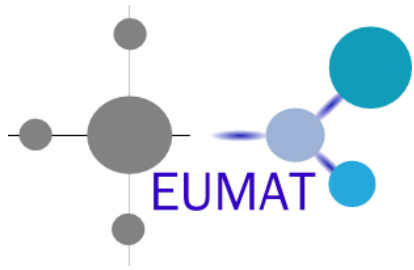
thin membranes, 3-4bar
thin membranes



Looking for partners

PEMFC Stack & MEA Reaching Stack & MEA targets

- ▶ **Bosch is looking for partners to achieve the targets**
 - ▶ **framework of publicly funded projects or joint development**
- Non-noble catalysts?**
- ▶ Bipolar Plate coating for improved contact resistance and reduced corrosion
 - ▶ GDL with tailored thickness, thermal conductivity, mechanical properties & water management
 - ▶ Electrodes with highly active and stable catalysts and optimized catalyst support
 - ▶ Membranes/Ionomers with good chemical and mechanical stability and high conductivity
 - ▶ Partners to develop and establish concepts for mass production and quality control
- ▶ Please contact Andreas Gehroid or Thilo Lehre for all topics related to materials, chemistry and industrialization @ advanced engineering level
 - ▶ andreas.gehroid@de.bosch.com, thilo.lehre@de.bosch.com



Contact details- PEM FC

Please contact:

andreas.gehrold@de.bosch.com,

thilo.lehre@de.bosch.com