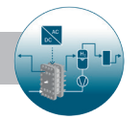
Stack Development

- Computer aided design and simulation
- Computational fluid dynamics
- Characterizing flow through porous media
- Mechanical stability calculations
- Sealing
- Durability tests at different operating conditions

Stack Manufacturing and Assembling

- Stamping
- Coating
- Quality control
- Robot assisted assembly
- Stacking and Bracing
- Sealing and Pressure tests

System Development



- Simulation aided dimensioning
- Manufacturing of pilot plant with 100 kW
- Development of safety concepts for charged operation
- Studies on optimal operating conditions
- Simulation aided analysis of the whole process chain including drying and purification of hydrogen
- Heat management

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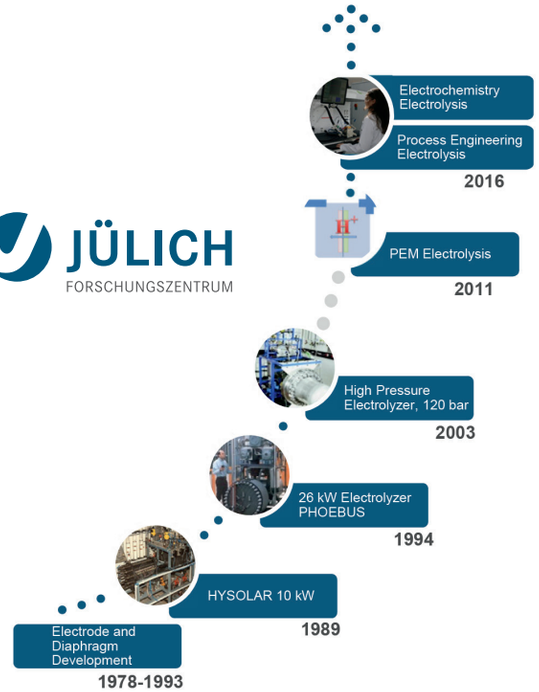

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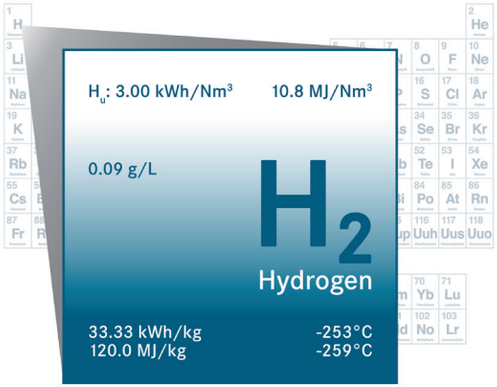
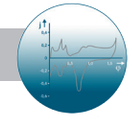
Motivation

The increasing **expansion of renewable energies** in Germany is coupled with a rapid rise in the share of intermittent wind and solar energy in the grid. Building up energy storage capacity with hydrogen produced by **water electrolysis from renewable** energies can solve the problem of power fluctuation.



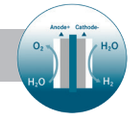
Scientists of the two departments (Electrochemistry Electrolysis EEL & Process Engineering Electrolysis VEL) are investigating electrolysis technologies of various stages of development. These include the research and development of alkaline electrolysis, PEM water electrolysis, and alkaline PEM electrolysis. The focus of all activities is on the priorities of cost reduction, increasing the efficiency, and improving the long-term stability.

Electrochemical Analysis



- Electrochemical screening of materials and components: RDE, DHE, single cells, etc.
- Evaluation of gas permeability, membrane conductivity, and membrane degradation
- Physicochemical characterization of components: TEM, XRD, SEM, XPS, etc.
- Electrochemical Impedance Spectroscopy (EIS)

MEA Development



- Catalyst screening
- Benchmark of catalysts and membranes
- Development of catalyst inks
- Analysis of most suitable coating techniques
- Manufacturing of CCMs and MEAs in laboratory scale

MEA Manufacturing Technology

- Process development and scale-up
- Dispersion preparation
- Coating and drying
- Assembling and joining
- Manufacturing analysis
- Rheology and tensiometry
- Roughness and surface free energy
- Coating window
- Drying analysis

Corrosion and Interactions

In situ

- Influence of operating conditions
- Corrosion at interfaces between different materials
- Reversible and irreversible corrosion phenomena

Ex situ

- Corrosion of catalyst and support
- Corrosion of bipolar plates
- Contact resistance of bipolar plates
- Corrosion of current collectors

Multi Phase Flow

- Two phase flows in porous gas diffusion layers
- Computer aided design and simulation
- Computational fluid dynamics
- Flow investigations with neutron radiation (BER II)
- Flow visualization by synchrotron radiation (BESSY II)
- Characterizing flow through porous media
- Permeability measurements with two phase flow
- Mechanical stability of porous gas diffusion layers

Tools

- Simulation
- Material characterization
- Manufacturing pilot plant
- Wide range of Manufacturing facilities
- Robot assisted assembly
- Electrochemical test benches
- Microscopic and macroscopic analysis