



### Name of the organization

Empa Switzerland, Eidgenoessische Materialspruefungs- und Forschungsanstalt

### Name of the infrastructure / laboratory

Laboratory for the Development of Materials for Hydrogen production (Lady)

### Address and country of the infrastructure / laboratory

Empa, Laboratory Hydrogen & Energy, Überlandstrasse 129, CH 8600 Dübendorf

### Person responsible of the access / Contact person

Dr. Ulrich Vogt

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### Main field of activity of the infrastructure / laboratory

► Hydrogen Production & Distribution

### Short description of the infrastructure / laboratory

(a) High Temperature Electrolysis by Solid Oxide Cells (SOEC)

Structural investigations (PSD, grain growth and coarsening effects, pore size distribution and grain boundary aspects), determination of chemical changes, material interactions and diffusion processes after long operation time in the  $\mu\text{m}$  and nm scale. Phase changes as well as nucleation and growth of new phases can be analysed by conventional XRD or into details by Synchrotron analysis.

(b) Alkaline electrolysis (laboratory scale). Tests carried out using electrolysis test apparatus (Fig. 2) developed by the Electrochemistry group of the laboratory Hydrogen & Energy, provide the results on the diaphragm/membranes' gas separation properties and their impact on the cell voltage. Monitored hydrogen and oxygen gas purity, together with the cell voltage, are critical parameters for ranking the efficiency of the newly developed membranes.

(c) Electrochemical characterization. Electrochemical Impedance Spectroscopy (EIS) is suitable for gathering better understanding of the ion conductivity of diaphragms/membranes. For this purpose, a two compartment 4-electrode electrochemical cell controlled by Zahner IM6eX potentiostat/galvanostat is used (Fig. 3). Moreover, electrochemical techniques, such as linear/cyclic voltametry, are undertaken in order to characterize the corrosion behavior of material.

### Main research area(s) of the infrastructure / laboratory

Hydrogen storage, hydrogen production, synthetic fuels, batteries, surface science, materials synthesis and characterization, electrochemistry

### Instruments and tools available for the above mentioned research

Standard solid state preparation methods (ball-milling) - Structural investigations by XRD, REM - Membrane performance test stand - Electrochemical impedance spectroscopy

