



Hydrogen research at the Fraunhofer LBF

The expert teams at Fraunhofer LBF have a high level of expertise and offer outstanding knowledge for R&D project in the context of hydrogen. Here are some examples of our competences:

- Development and validation of components and systems for hydrogen systems, e. g. the fuel cell.
- Knowledge and technical facilities for system, component and material analysis
- Implementation of modern application-oriented and cross-technology validation and assurance procedures under quasi-static and cyclic loading
- Validation and improvement of fuel cell reliability
- Basic research on the influence of hydrogen on material fatigue
- Contract research with industry
- Involvement in various networks dealing with hydrogen

Challenges for Material Research and Material Development

The effects of hydrogen on materials under temperature as well as quasi-static, cyclic and dynamic loads must be described in more detail for a safe component design. This opens up potential for increasing system reliability and service life.

Contact

Dr.-Ing. Christoph Bleicher
Group manager Qualification of
cast components
Tel. +49 6151 705-8359
christoph.bleicher@
lbf.fraunhofer.de

Fraunhofer LBF
Bartningstr. 47
64289 Darmstadt



Fraunhofer Institute for Structural
Durability and System Reliability LBF

Reliable. Tailor-made.

Materials for Hydrogen systems

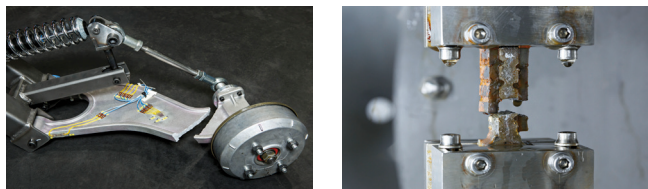
Challenges on the way to a hydrogen economy

Hydrogen is considered one of the cornerstones for climate-neutral, sustainable energy and mobility of the future. The production of green hydrogen also requires the use of »green« materials. Fraunhofer LBF develops material solutions as well as evaluation and analysis methods for the hydrogen economy, thus ensuring the reliability of hydrogen-impacted systems.

Safety and reliability of hydrogen technologies and their components

Fraunhofer LBF supports companies in the fields of transportation, energy, mechanical and plant engineering in the development of reliable, lightweight, and efficient products that are in contact with hydrogen. For this purpose, customer-specific or individual analysis and test concepts are used to meet the increased requirements for fatigue strength verification and to optimally represent real operating conditions.

Fraunhofer LBF is also developing comprehensive findings and methods for the reliability and fatigue of materials and systems exposed to hydrogen in cooperation with a large



Customized analysis of components according to their specific requirements

number of industrial partners. For example, studies are carried out on the influence of hydrogen on the fatigue of different materials and the fundamental experimental and numerical analysis as well as multiphysical validation of components and systems for hydrogen applications with the aim of optimizing lifetime estimation, reliability and efficiency. For this purpose, the scientists at Fraunhofer LBF develop modern validation methods that are relevant to practice and cross-technology.

Modern test facility and individual methods

The Fraunhofer LBF has a comprehensive investigation and validation infrastructure, some of which has been individually developed, such as a servo-hydraulic testing rig with a hydrogen pressure autoclave and temperature control unit for investigating hydrogen corrosion under cyclic loading. Among others, these special methods are used:

- Monitoring of hydrogen pressure tanks by Acoustic Emission.
- Investigation of materials under hydrogen influence
- Multiphysical experimental simulation of fuel cell subsystems
- Lifetime analysis of the overall fuel cell system



Tailor-made analysis concepts for the development of products in contact with hydrogen«

Dr. Christoph Bleicher,
Qualification of cast components