

Materials meet future challenges

Fraunhofer ISC's functional materials enable hydrogen technologies

Fraunhofer ISC headquarters

Profile – the Institute in a nutshell

Fraunhofer-Institute for Silicate Research ISC is one of Germany's leading R&D centers for material-based research and development in the fields of resource efficiency, sustainability, energy, environment and biomedicine.

With a permanent staff of about 400 scientists and technicians the Institute develops innovative functional materials and technologies for more sustainable products – on behalf of its customers and with less resource input. Fraunhofer ISC is dedicated to make essential contributions to solving the major global issues and challenges of the future.

With its headquarters and the Translational Center for Regenerative Therapies TLC-RT in Wuerzburg, and its Center for High-Temperature Materials and Design HTL at Bayreuth Fraunhofer ISC combines first-rate expertise in materials science and processing, industrial application and the upscaling of production and process technologies to pilot scale as well as in materials analysis and characterization.

Materials meet ...

... Energy and Climate

New lithium-based storage technologies as well as efficient, resource-conserving energy conversion and optimized high-temperature processes significantly reducing CO₂ emissions.

... Biomedicine

ISC brings together material syntheses, cell biological systems and additive manufacturing processes, opening up new biomedical applications in regenerative medicine.

.... Bioeconomy and Environment

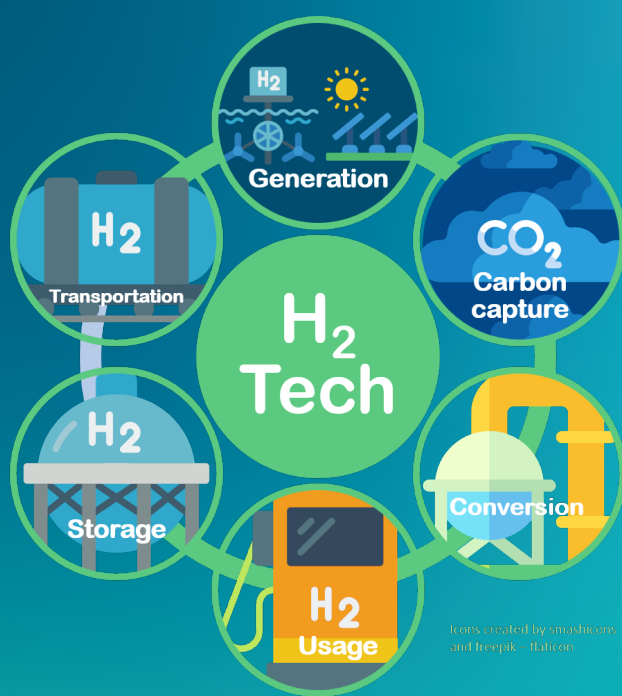
Sustainable solutions for the refinement and efficient use of renewables. ISC portfolio offers biogenic functional materials and recyclability by simplifying complex material composites.

... Digitization

Digitized processes and artificial intelligence for knowledge-based new products, processes and applications to be brought from the idea to technical market maturity more efficiently.

Tech

for energy
transition,
climate
action and
sustainability



Enabling hydrogen technologies

Fraunhofer ISC develops, optimizes, and analyzes materials and components as well as sensor technologies used along the hydrogen value chain for different applications in various projects and groups – including processing and scaling up to pre-industrial TRL.

Specific competencies along the energy transition value chain

Green power – regenerative energy harvesting

- Photovoltaics: anti-x coatings (reflection, soiling), tandem solar cells, perovskite solar cells, surface patterning
- Structural health monitoring

Efficient energy storage and conversion

- Advanced Batteries: Li-ion, Li solid state, lead-acid, SoX battery sensors
- Fuel cells: catalysts, electrodes, sealing/joining (glass solders)
- Hydrogen production: catalysts/electrodes for electrolysis
- Hydrogen sensor technology (currentless)
- Design of material surfaces and electrodes
- Electrochemical characterization, material characterization (also on multi-scale level)
- Realizing lightweight designs: H₂-tight composite materials for storage

Industrial resources (Power-to-X)

- Catalysts for CO₂ conversion, sun fuels, sun chemicals
- Carbon capturing: catalysts, electrodes
- Optimization of industrial processes (CO₂ release and CO₂ conversion)

Transportation and final usage (e-mobility, power supply)

- H₂ production and distribution
- Permeation barrier layers (storage, transport)
- Hydrogen sensor technology (currentless)
- Fuel cell technology
- Thermal management
- High-temperature processes – advanced simulations, process optimization (glass/ceramics/iron/steel), novel high-temperature materials

Recently started projects

- **Spotlight:** Disruptive photonic devices for highly efficient, sunlight-fueled chemical processes
- **KuWaTa:** Fiber stabilization of spherical polymer tanks
- **BIOLIGHT:** Biocatalysis
- **CSA SUNER-C:** European network – strategic technology roadmap to widespread application of solar fuels and chemicals

Our offer

- Development: functional materials, sensors, processing technology
- Simulation
- Scale-up to pilot
- Automation
- Failure analysis
- Material characterization
- Testing

H₂

Materials and technologies for production, storage, transport, usage

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