

**Fraunhofer Institute for
Chemical Technology ICT**

Oliver Geiger • Phone +49 721 4640-429
oliver.geiger@ict.fraunhofer.de • www.ict.fraunhofer.de

**Fraunhofer Institute for
Industrial Mathematics ITWM**

Oliver Wirjadi • Phone +49 631 31600-4396
oliver.wirjadi@itwm.fraunhofer.de • www.itwm.fraunhofer.de

**Fraunhofer Institute for Manufacturing Engineering and
Applied Materials Research IFAM**

- Bonding Technology and Surfaces -
Dr. Silke Mai • Phone +49 421 2246-400
silke.mai@ifam.fraunhofer.de • www.ifam.fraunhofer.de

Fraunhofer Institute for Mechanics of Materials IWM

Dr.-Ing. Bärbel Thielicke • Phone +49 761 5142-193
baerbel.thielicke@iwm.fraunhofer.de • www.iwm.fraunhofer.de

**Fraunhofer Institute for
Structural Durability and System Reliability LBF**

Prof. Dr.-Ing. Andreas Büter • Phone +49 6151 705-277
andreas.bueter@lbf.fraunhofer.de • www.lbf.fraunhofer.de

**Hybrid and Integrated Lightweight Systems –
from Research to Application**

Lightweight construction is the technically and economically feasible maximum weight reduction while maintaining sufficient stiffness, dynamic stability, and fatigue strength. Successful lightweight concepts are based on specific know-how in many areas of materials and engineering science as well as on „systemic“ thinking. The combination of different material classes into hybrids also plays an ever more important role – reflected by the proclaimed Fraunhofer future topic of „Hybrid Material Structures“.

**Fraunhofer Innovation Cluster Technologies for Hybrid
Lightweight Construction „KITE hyLITE“**

To strengthen interinstitutional competences, the Fraunhofer-Gesellschaft founded the „Innovation Cluster Technologies for Hybrid Lightweight Construction - KITE hyLITE“. The aim of „KITE hyLITE“ is to exploit synergies between complementary areas of research in the fields of fiber-composite materials and the implementation of research results in hybrid lightweight construction applications. Exhibits will include a sheet molding compound manufactured lightweight wheel as well as different prototype component-like specimen of fiber reinforced materials, hybrid, and sandwich materials.

At present, the Fraunhofer-Gesellschaft holds more than 80 research establishments in Germany, 59 of which are Institutes. 17,000 employees, primarily with a natural science or engineering science background, work the annual research volume of 1.6 billion Euros. 1.3 billion Euros of which account for research under contract. Two thirds of this budget is generated by the Fraunhofer-Gesellschaft with industrial contracts and publicly financed research projects.

Technical coordination

Prof. Dr.-Ing. Frank Henning • Joseph-von-Fraunhofer-Str. 7
76327 Pfinztal • Germany • Phone +49 721 4640-420
Fax +49 721 4640-332 • frank.henning@ict.fraunhofer.de
www.ict.fraunhofer.de

Project management

Susanne Pichotta • Phone +49 89 1205-1377
susanne.pichotta@zv.fraunhofer.de

Press

Britta Widmann • Phone +49 89 1205-1302
britta.widmann@zv.fraunhofer.de

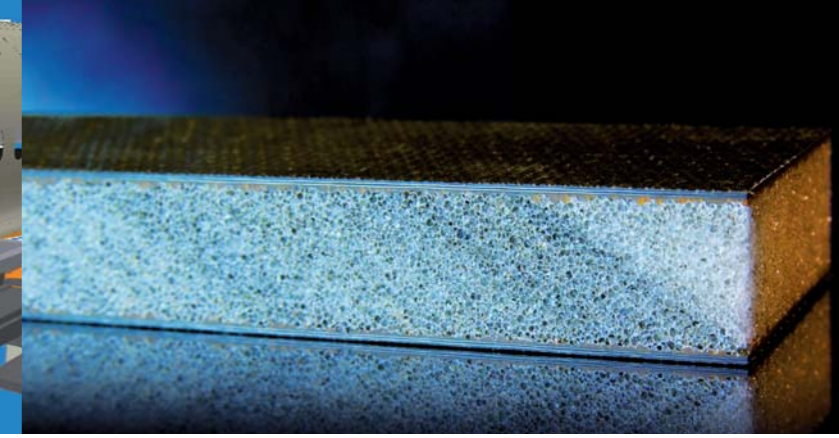
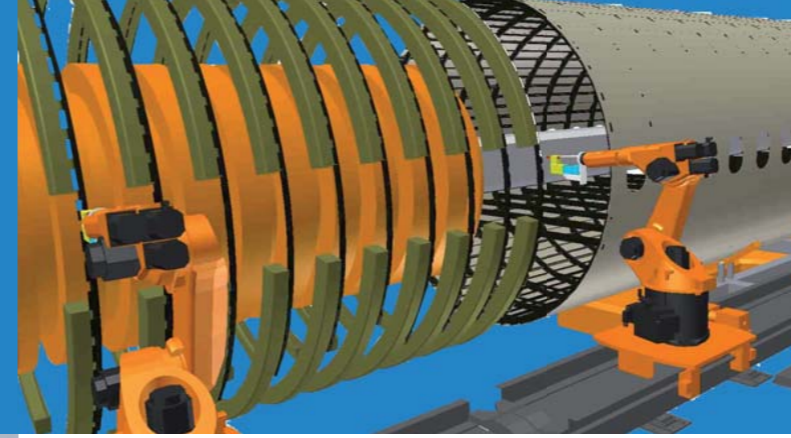
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HYBRID AND INTEGRATED LIGHTWEIGHT
SYSTEMS

COMPOSITES EUROPE



HYBRID AND INTEGRATED
LIGHTWEIGHT SYSTEMS FROM
RESEARCH TO APPLICATION



FRAUNHOFER LBF

The exhibit shows the wing model of a light aircraft with future integrated structural health monitoring (SHM). Four types of sensors are attached to the wing to register strains occurring during the flight. In the future, the monitoring of structural strains and impacts will allow for estimating the remaining life of a structure. Thus, knowledge of the actual stress will help to determine individual (and therefore longer) maintenance intervals as well as to exploit the lightweight potential of a permanently monitored structure.

FRAUNHOFER ICT

Fraunhofer ICT exhibits different demonstrators and prototype components of compound materials, including exhibits of the future technologies pultrusion and thermoplastic tape laying at ICT as preview. Further exhibits include components manufactured by duromeric and thermoplastic resin transfer molding, sandwich structures of polyurethane fiber spray process, and different demonstrators of the process optimization of sheet molding compound and long fiber-reinforced thermoplastics.



FRAUNHOFER IFAM

In addition to personnel qualification as a fiber reinforced plastic technician and adhesive bonding technology workforce training, the Fraunhofer IFAM presents a concept for adhesive bonded structural repairs of fiber-composite plastic components suitable for field application with the example of an outer skin stringer component of an airplane landing flap. What is new to this approach is that as load-bearing, non-riveted repair may be performed in relatively short time. It contributes considerably to weight savings for lightweight structures. In the area of manufacture, the Fraunhofer IFAM is engaged in the assembling and processing of 1:1 scale carbon fiber reinforced plastic structures.

FRAUNHOFER ITWM

The Fraunhofer ITWM presents a user-friendly software for the analysis and visualization of micro structures in volume images. The product MAVI (Modular Algorithms for Volume Images) offers the possibility of a 3-D image analysis. Materials which may be examined include metals, ceramics, polymers, concrete, and textiles as well as biological materials and medical preparations. With the software MAVI, the focus is on problem and process analysis, process modeling, and software development.

FRAUNHOFER IWM

The focus of the Fraunhofer IWM is the analysis of the behavior of modern composite materials under various processing and usage-related load scenarios. Experimental as well as numeric methods were used to analyze, among others, the damage tolerance of highly stressable sandwich structures for aviation applications and the load application to SMC and LFT structures by means of metallic inserts. Further exhibits demonstrate the development of special methods for gaining comprehensive material understanding and characteristic material data for safe component dimensioning.