Fraunhofer WKI

Fraunhofer Institute for
Wood Research, Wilhelm-Klauditz-
Institut, WKI

Sustainability since 1946

For a future worth living

https://www.wki.fraunhofer.de/en/about-us/profile/sustainability.html

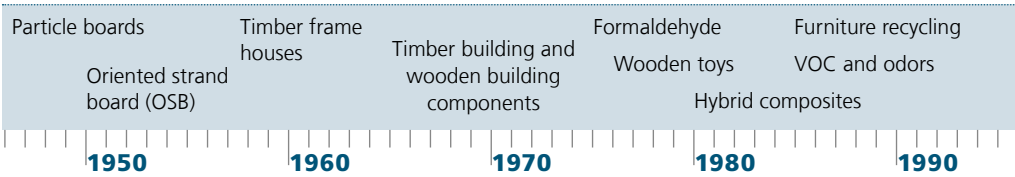
Our Roots

"The major skill in this region will be to manage the cultivation of the wood in such a way that a continuous and sustainable utilization is possible."

Hans Carl von Carlowitz (1645–1714), senior mining officer from Freiberg (Saxony)

Carlowitz made this statement in 1713 in his book "Sylvicultura oeconomica", the first independent book on forestry. He is regarded as the creator of the term "Nachhaltigkeit" (sustainability). His guiding principle also inspired Dr. Wilhelm Klauditz, the founder and eponym of the Fraunhofer WKI.

In the 1940s, Dr. Klauditz was searching for solutions in order to be able to optimally utilize the supply of raw wood, which had become scarce due to the war, and to enable the technical utilization of waste wood and small-dimensioned wood. He is regarded as a co-founder of the modern wood-based materials industry.



Our Future

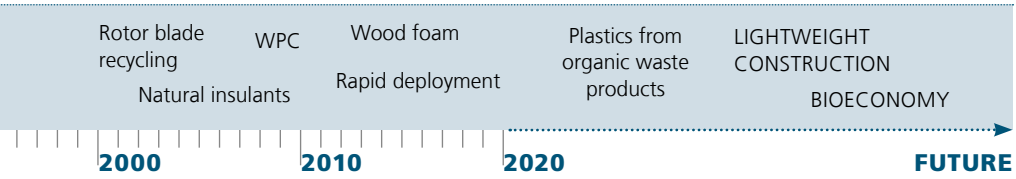
"We have been developing resource-saving and climate-friendly materials and technologies for more than 75 years."

Prof. Dr.-Ing. Bohumil Kasal,
Director of the Fraunhofer WKI

Today, we at the Fraunhofer WKI investigate a wide range of renewable raw materials as well as their holistic utilization - from production through to recycling.

In six scientific departments, we develop bio-based materials and environmentally-friendly manufacturing processes for the wood and furniture industries, the construction industry, the chemical industry, the packaging industry and automotive construction.

A particular focus is thereby directed towards sustainable light-weight-construction solutions. Our holistic research approach furthermore includes the development of material recycling processes, life-cycle analyses and indoor-air analysis.



Bioeconomy

With the development of sustainable materials and technologies, we are making an important contribution towards a bio-based recycling economy.

We create the basis necessary for reducing the use of fossil raw materials and, consequently, avoiding environmental pollution. In our research work, we utilize renewable raw materials such as wood, hemp fibers and flax fibers, lignin, sugar and agricultural waste.

Our research fields

- Surface coatings for wooden components and WPC with functional properties, such as flame retardancy
- Adhesives for wood-based materials and building constructions
- Basic chemicals for bio-plastics
- Natural-fiber-reinforced (bio-)plastics for injection-molded parts, e.g. for reusable and disposable containers (transport boxes), vegetable crates or shampoo bottles
- Printing inks and biopolymers for novel 3D printing processes (UV-curing)
- Lightweight and high-performance (composite) materials, such as those used for buildings, vehicles and furniture
- Foams, e.g. for packaging and as core material for lightweight-construction parts
- New applications for specially pre-treated natural fibers, e.g. in engineering thermoplastics

Construction

Global challenges such as climate change and the housing shortage in urban areas are placing new demands on the functionality and environmental balance of buildings. In view of this, lightweight-construction solutions play a major role.

Wood and other renewable raw materials are ideally suited for this purpose. Compared to conventional building materials such as steel, concrete and masonry, they are very light, easy to process, and regionally available. They also bind CO_2 and have proven to be advantageous in terms of earthquake resistance, thermal insulation and indoor climate.

Our research fields

- Hybrid materials, building elements and constructions with technical functions and positive environmental properties, such as various combinations of wood, concrete and wood foam as well as natural-fiber textiles and natural-fiber composites
- Use of low-value coniferous and deciduous wood as well as regional plants and waste
- Natural insulation materials
- Profiles made from (bio-)plastics, reinforced with plant residues for decking, façades and windows
- Flame-retardant coatings
- Statistically secured characteristic values for natural building materials
- Earthquake-proof wooden structures and connectors for multi-story building construction

Mobility

In the automotive industry, lightweight-construction solutions are gaining in importance as a result of rising energy costs and strict environmental regulations.

Using renewable resources as the basis, we develop high-performance lightweight components for automotive construction. In this way, we are able to offer an economically attractive possibility for improving the environmental balance of vehicles.

From the very beginning, automobiles, ships and railway carriages were built from wood. We have returned to these roots and are guiding traditional materials into the future by means of modern technology.

Our research fields

- Body parts made from natural-fiber-reinforced plastic with outstanding acoustic and crash-relevant properties for road vehicles
- Structural components and complete assemblies for road and rail vehicles using wood-metal construction methods
- Non-combustible interior equipment for ships, e.g. cabin walls
- Vehicle seats and seat covers on the basis of renewable raw materials
- Technical textiles with natural-fiber content and special functions, e.g. as semi-finished products for composites, produced on double-gripper weaving machines

Recycling

The responsible handling of resources means reducing waste. Even renewable resources are not infinitely available.

During the development of new materials and products, we also keep an eye on their recycling after use – preferably into new materials.

We also design customized recycling processes for existing products. Our goal is to enable multiple to infinite use of the utilized raw materials (cascade utilization) and, as a consequence, to reduce the need for new resources.

Our research fields

- Recycling of (bio-)plastics and (bio-) composite materials
- Recycling of old wood, old windows and wood-plastic composites (WPC)
- Utilization of waste products, e.g. old bakery products as starting material for bio-plastics, and balsa wood from wind-turbine rotor blades for particularly light insulation mats
- Use of agricultural residues such as beet pulp, wheat straw, rice husks and corn cobs
- Cascade utilization and life-cycle analysis

Imprint

Image Sources

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Photos in inner section, from left to right:
- Lignin powder from plant residues as a basic building block for climate-friendly paints, adhesives and plastics
- Polyester resin as starting material for UV-curable materials for 3D printing
- Insulation mats made from renewable raw materials
- Wood-concrete composite
- Door of the Bioconcept-Car, made from natural-fiber-reinforced plastic
- Natural-fiber yarn
- Balsa wood pieces from wind-turbine rotor blades
- Old bakery products as starting material for bio-plastics

Publisher

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