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Mission for the future of building – affordable.sustainable.safe

Fraunhofer Institute for Building Physics IBP at BAU 2025

Times remain challenging for the construction industry: the ongoing climate change with its extreme weather events, the growing scarcity of the resources needed to manufacture key building materials, as well as rising building costs, urgently call for new solutions. At the BAU 2025 trade fair, which is taking place in Munich from January 13 to 17, 2025, Fraunhofer IBP will be presenting innovative products and system solutions as part of a special exhibition titled “Mission for the future of building – affordable.sustainable.safe” at the Fraunhofer Building Innovation Alliance booth (Hall C2, Booth 528).

Building solutions for the future are more in demand than ever. The focus is particularly on criteria such as sustainability in the building materials sector, increasing productivity to ensure that construction and renovation remain affordable, and making towns, cities and buildings more resilient to climate change and its effects. At the BAU 2025 trade fair, Fraunhofer IBP will be showcasing promising innovations and ways to meet the challenges facing the construction industry at its joint booth with the Fraunhofer Building Innovation Alliance.

Renovating buildings quickly, efficiently and sustainably

In the **lead project “BAU-DNS – sustainable, digital, systemic”** led by the Fraunhofer IBP, researchers from seven Fraunhofer institutes are developing modular, holistic and circular renovation methods. The aim is to increase productivity in the field of renovation, keep costs in check, advance the circular economy and pave the way for CO₂-neutral materials and systems. This would mean that renovation work could be completed 10 to 15 percent faster, while the gray energy of material flows could be halved using bio-based materials and other approaches. The focus of the lead project is not primarily on product development, but rather on elementary preparatory work. As a result, industrial customers can develop specific solutions together with the researchers in follow-up projects – without having to carry out lengthy analyses of the supply chain. The added value of the lead project is thus of direct benefit to companies. Interested parties can obtain more detailed information at the exhibition booth and also view exhibits from the project.

Building materials for the future

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What would the ideal concrete look like? This is the question that scientists at the Fraunhofer IBP are asking themselves and they will be bringing their current solutions from concrete research to the trade fair.

One of the keys to more climate-friendly concrete is pyrochar. During its production, plant residues or other organic substances such as methane are processed in an atmosphere low in oxygen. Up to 40 percent of the carbon contained in the plants is stored as solid matter in the form of pyrochar. From a mathematical point of view, its integration means that more carbon dioxide is bound in the concrete than is emitted during its production. The researchers have also developed a process for granulating the pyrochar. The resulting granules, which are less than two millimeters in size, are used instead of sand in the concrete. This not only makes the concrete more climate-friendly, but also significantly lighter, which additionally saves on transport costs. However, in the search for the concrete of the future, it is also worth taking a look at the past. In fact, **Roman concretes** used in ancient times meet all the criteria of modern sustainable building materials. They are cement-free, long-lasting, consist of locally-sourced materials such as volcanic ash, and are resilient to many external influences. Unfortunately, the underlying recipes have been lost. In the RICIMER project (Roman Inspired Cement Innovation by Multi-Analytical Enhanced Research), experts are researching possible formulations. Their aim is to decode the original recipes, including additives, and transfer them to modern building materials.

Alkali-activated binders, also known as **geopolymers**, are an innovative and growing field of research. With properties such as corrosion resistance, high strength and excellent temperature resistance, they offer a wide range of potential applications, particularly in the construction industry.

At Fraunhofer IBP, a process has been developed to produce a high-quality and, above all, climate-friendly building material known as **Typhaboard**, from the renewable raw material Typha (cattail). This versatile insulation and wall-building material consists of cattail leaves and a mineral binder, which are pressed into multifunctional boards. Typhaboard combines many of the properties needed to make a useful building material. In addition to being robust, it boasts good sound and thermal insulation, displays excellent hygrothermal properties, is mold-resistant, and also offers a high level of fire protection.

Detecting and treating contaminated building materials

Particularly during renovation work, building materials from past decades often cause problems. For example, asbestos was used in many prefabricated houses in the 1960s and 1970s, while in the 1970s and 1980s around three million buildings in Germany were treated with wood preservatives containing PCP and lindane. These substances have since been banned as they are classified as being carcinogenic. Two ways of dealing with these materials will be presented at the BAU trade fair.

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To make the **detection of asbestos in building rubble** easier and faster, researchers at the Fraunhofer Institute for Optronics, System Technologies and Image Exploitation IOSB and the Fraunhofer Institute for Building Physics IBP have developed a new method. This does not require the removal and preparation of samples, can be used to analyze large areas and is more cost-effective than existing detection methods, such as those using a hyperspectral camera. Furthermore, a portable hand-held device can be used either directly on site or mounted in a fixed position above a conveyor belt. An application for a patent has already been filed.

In the **CycloPlasma** project, which is funded by Fraunhofer-Zukunftsstiftung, researchers at Fraunhofer IBP are investigating the extent to which the novel CycloPlasma process can be used to decontaminate PCP and lindane. The process combines an innovative adsorber material with plasma technology. The result: the CycloPlasma process can be used to treat both contaminated wood and interiors - sustainably, residue-free and without posing a health risk. The researchers were able to demonstrate the effectiveness of the method in pilot projects on the grounds of the Glentleiten Open-Air Museum and in the royal stables of Nymphenburg Palace.

Strengthening the resilience of cities

Urban areas are especially sensitive to extreme weather events such as heat, drought and storms. Cities therefore need to be able to adapt in response to climate change and its effects. **Advanced urban climate models** such as PALM-4U are an effective aid in this regard, because the urban climate can be experienced via simulations. These enable clear and comprehensible information to be gained about climate change and urban climate relationships. Municipalities, planners and project developers can use PALM-4U to study and optimize the climatic effects of their planning measures. This simulation model is already freely available as an open-source solution and can be easily implemented using the cloud-based platform OASITY.

Not only do people want more green spaces in cities; insects and birds are also finding it increasingly difficult to find food, shelter and nesting places in urban areas. One approach to solving this problem is to green façades and roofs. Together with the University of Stuttgart's Institute for Acoustics and Building Physics and Institute for Landscape Planning and Ecology as well as HELIX Pflanzensysteme GmbH, Fraunhofer IBP is developing a green façade system that promotes biodiversity by creating a habitat specifically for native wild shrubs, herbs and grasses, thus offering food and shelter for the accompanying fauna while also regulating the climate. The Stuttgart Climate Innovation Fund and the Federal Ministry of Food and Agriculture (BMEL) are funding the three-year research project. The **Wild Climate Wall** will be on display at the Fraunhofer Building Innovation Alliance booth during the BAU 2025 trade fair in Munich.

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With the help of the **“Climate-friendly urban design” training course**, urban planners and municipal employees are given the opportunity to acquire expertise in this crucial planning area. Through a combination of live online sessions, a two-day in-person event, and self-directed learning units, they learn how to address the challenges of climate change in urban areas and how to develop and implement effective adaptation measures. Visitors to the BAU trade fair can obtain more detailed information and advice on this topic. Palace.

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Support for small and medium-sized enterprises

Again, this year, **Mittelstand-Digital Zentrum Bau** will be presenting its services for small and medium-sized enterprises in the construction and real estate sectors at the Fraunhofer Building Innovation Alliance booth. The focus of the center, which is made up of four consortium partners from science and practice and is run by Fraunhofer IBP, is on the five topics of Planning Processes, Construction Sites, Facility Management, the optimization of digital Business Processes and the development of innovative Transformation Strategies. To this end, the center offers detailed information brochures, events and digitization projects with strategic roadmaps to make SMEs resilient. Employees of the center will be available for discussions during the fair.



The Wild Climate Wall is an innovative green façade system to promote biodiversity and climate resilience in urban, heavily built-up areas.

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Concrete with (left) and without pyrochar: One part pyrochar reduces three parts CO₂ of the overall product.

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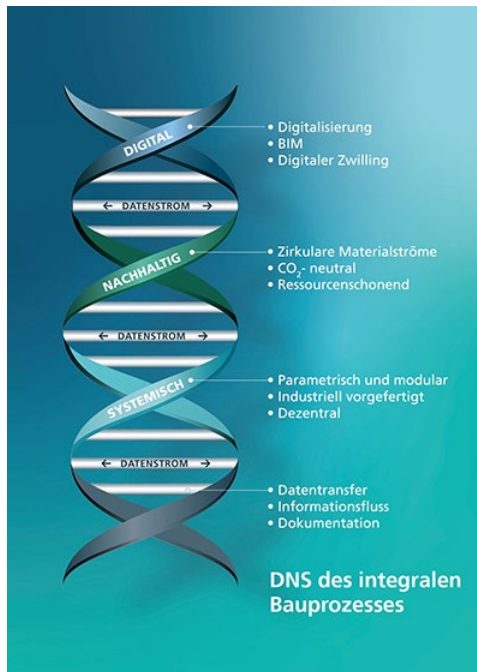
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The CycloPlasma process for decontaminating building materials containing PCP and lindane.

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The Fraunhofer lead project
"BAU-DNS": digital,
sustainable, systemic

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Building physics is one of the keys to a successful building project. The **Fraunhofer Institute for Building Physics IBP** focuses its work on research, development, testing, demonstration and consulting in the various fields of building physics. These include noise control and sound insulation in buildings, the optimization of auditoria acoustics and solutions for improving energy efficiency and optimizing lighting technology. Fraunhofer IBP's work also covers issues of climate control and the indoor environment, hygiene and health protection, building material emissions, weatherproofing and protection against heat and moisture, preservation of building structures and the conservation of historic monuments.
