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SSbD25 is the second edition of the annual SSbD conference, where researchers, industry and policymakers meet to discuss topics related to Safe-and-Sustainable-by-Design (SSbD).

The SSbD25 Conference is co-organized by the IRISS International SSbD Community and Empa – Swiss Federal Laboratories for Materials Science and Technology.

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This document compiles the abstracts presented, either as oral contributions or posters, during the SSbD25 Conference, held in Dübendorf, Switzerland, from 10 to 12 November 2025, co-organized by IRISS and Empa. All authors granted permission for their abstracts to be published in the Book of Abstracts.

About IRISS International SSbD Community

IRISS is the international ecosystem for accelerating the transition to Safe-and-Sustainable-by-Design (SSbD) materials, products, and processes. Its purpose is to connect, synergize, and transform the SSbD community in Europe and globally towards a lifecycle approach, where safety, climate neutrality, circularity, and functionality are integrated from the earliest stages of design and production. A core element of IRISS is the active involvement of industry, engaging diverse value chains such as automotive, construction, electronics, energy, fragrance, packaging, and textiles. By connecting science, industry, and policy, IRISS provides a platform for knowledge exchange and co-creation to drive sustainable transformation.

About Empa – Swiss Federal Laboratories for Materials Science and Technology

As an interdisciplinary research institute of the ETH Domain, Empa links cutting-edge research in materials science and technology to practical applications with the goal of tackling the primary challenges facing industry and society. An efficient technology transfer in close cooperation with its industrial partners results in marketable innovations and customized solutions that not only enhance their innovative edge and international competitiveness, but also help to improve the quality of life for the public at large. A careful use of natural resources and thinking in closed cycles are core to its approach: Empa – The Place where Innovation Starts.

Towards a Safe-and-Sustainable-by-Design Framework for Engineered Living Materials

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Engineered Living Materials (ELMs) represent a new generation of sustainable construction materials that integrate biological systems to achieve self-healing, adaptability, and environmental resilience. By embedding living microorganisms within material matrices, ELMs can repair damage, sense environmental changes, sequester carbon, and even produce light, all while reducing the need for synthetic chemicals and minimizing environmental impact.

Our research explores how the principles of Safe-and-Sustainable-by-Design (SSbD) can guide the development of such bio-integrated systems, ensuring that safety, functionality, and sustainability are considered from concept to application. As an example, in the REMEDY project we are developing living microbial inks designed to form self-regenerating biofilms on building surfaces. These biofunctional coatings demonstrate how resilient microorganisms, such as fungi and bacteria, can be harnessed to protect materials from weathering, pollution, and degradation while enabling new aesthetic and ecological functions.

By aligning biological design with SSbD thinking - covering safety, stability, and environmental performance - this work illustrates pathways toward regenerative and probiotic architecture, where buildings coexist and coevolve with their environment. The current SSbD frameworks provide valuable guidance for chemical and material systems, but living materials challenge existing definitions of safety, functionality, and life-cycle assessment - calling for an adapted, biology-aware SSbD approach.

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