Wood-Science-Economy

BOOK OF ABSTRACTS

5th International Scientific Conference
WOOD-SCIENCE-ECONOMY

Sustainable Solutions and Digitalization in Forest-Wood Sector

Poznań, 3-5 December 2025

Łukasiewicz
Poznań Institute of Technology

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Industry
Contact
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Digital
Transformation

Ministry of Science and Higher Education
Republic of Poland

Co-financed by the project of Minister of Science and Higher Education "Industry Contact Points for the Horizon Europe Research and Innovation Framework Programme"

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Beyond Traditional Coatings: Toward Engineered Living Materials for Architecture

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ABSTRACT

Architectural coatings enhance the functional and aesthetic durability of building materials by protecting surfaces from heat, UV radiation, and moisture. Increasing environmental concerns are driving the development of sustainable alternatives to conventional surface treatments, which often rely on environmentally harmful components. A promising strategy involves the biomimetic design of coatings that imitate the protective mechanisms observed in nature.

The ARCHI-SKIN project follows this bioinspired approach to develop engineered living materials (ELMs) for architectural applications. ELMs incorporate living cells (e.g., microorganisms) as active components, either embedded within a matrix or forming part of a living scaffold, to provide self-sustaining functionality. In this project, we explore coatings based on living fungal biofilms as active protective systems for various substrates, including wood, concrete, brick, stone, metal, and plastics. Fungi, particularly *Aureobasidium pullulans*, are well suited for this purpose due to their ability to grow on surfaces, secrete extracellular enzymes, and form robust biofilms.

The project aims to create a prototype microbial coating featuring controlled and optimized fungal biofilm formation to protect surfaces, extend service life, and introduce advanced functions such as self-healing and bioremediation. By integrating living systems into coating technologies, ARCHI-SKIN seeks to expand the concept of traditional materials toward adaptive, responsive, and environmentally integrated living architectural coatings. This contribution presents the project's objectives, challenges, and first results.

KEYWORDS: Engineered Living Materials, bioinspired coatings, fungal biofilm, sustainable building materials, alternative materials protection