

The 10th ECCOMAS Thematic Conference on
the Mechanical Response of Composites

COMPOSITES 2025

9-11 September, 2025
Vienna, Austria

BOOK OF ABSTRACTS



**10th ECCOMAS Thematic Conference on the Mechanical Response of Composites
Book of Abstracts**

published 2026

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Conference website: <https://composites2025.cimne.com/>

DOI: <https://doi.org/10.34726/11919>

PREFACE

On behalf of the European Community on Computational Methods in Applied Sciences (ECCOMAS) it has been our honor to organize the 10th Thematic Conference on the Mechanical Response of Composites (Composites2025). The conference was hosted by the Institute of Lightweight Design and Structural Biomechanics, TU Wien, Vienna, Austria. The conference contributions are collected in this Book of Abstracts.

ECCOMAS is a scientific organization grouping together European associations with interests in the development and application of computational methods in science and technology. The mission of ECCOMAS is to promote joint efforts of European universities, research institutes and industries which are active in the broader field of numerical methods and computer simulation in engineering and applied sciences and to address critical societal and technological problems with particular emphasis on multidisciplinary applications.

Following the very successful conferences in Porto, London, Hannover, the Azores, Bristol, Eindhoven, Girona, Gothenburg (on-line), and Trapani, the 10th ECCOMAS Thematic Conference on the Mechanical Response of Composites was held in Vienna, Austria. The scope of Composites2025 is to provide a forum for the exchange of knowledge and current research and development on composite materials and structures. The conference focuses mainly on theoretical and numerical modelling and prediction of the performance of composite components, also covering experimental validation and challenging industrial applications or recent developments.

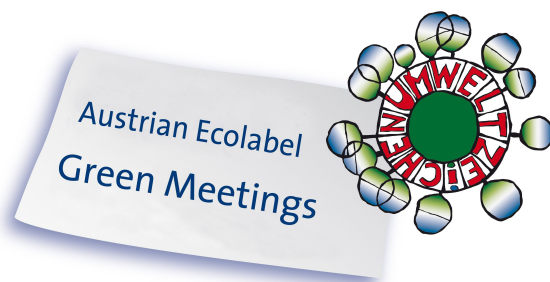
Composites2025 is certified as a Green Meeting and is organized in accordance with the criteria of the Austrian Ecolabel for Green Meetings and Events. Sustainability is a core principle of the event planning process – from selecting regional, certified partners to minimizing waste and emissions. The goal is to reduce the environmental footprint of the event while serving as a model for responsible science communication.

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The editors



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A Resin Infiltration Model to Optimize Transparent Wood Production

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ABSTRACT

Transparent Wood (TW) is a promising composite characterized by lightweight and transparency to visible light, along with its sustainability (see references in [1]). By using successive treatments (i.e., delignification, infiltration with suitable resins and, eventually, functionalization) TW becomes a good candidate to replace glass and plastics in several industrial applications, such as construction, automotive, electronics and furniture. The AI-TranspWood project [1], funded by the European Commission, has the ambition to create an AI-driven multiscale methodology for TW composites. In this context, modelling of resin infiltration into delignified wood is an important step to understanding and optimizing the fabrication of TW products.

In the present work, TW samples were prepared starting from pristine birch and balsa wood (0.7 – 1.4 mm thick), cut into 5 cm squares. The delignification was achieved by immersing the samples in a solution at pH 4.6 containing 1 wt% sodium chlorite, at a temperature of 80 °C for a total time of 18 h. The infiltration of a monomer (HEMA) was carried out under vacuum for up to 18 h. The infiltrated wood was sealed between two glass plates and placed in an oven at 80 °C for 4 h to allow the polymerization of HEMA.

The numerical model is based on the Darcy law with flux $\mathbf{J} = \frac{\mathbf{k}(S)}{\mu} \cdot \nabla p$ where $\mathbf{k}(S) = S\mathbf{k}_0$ is the intrinsic permeability tensor, μ the fluid viscosity, ∇p the pressure gradient, and $S = S(p)$ is the saturation. The saturation curve $S(p)$ is determined by the pore size distribution given by a mean and standard deviation. The material properties are assessed starting from the ones of pristine wood available from the literature [2].

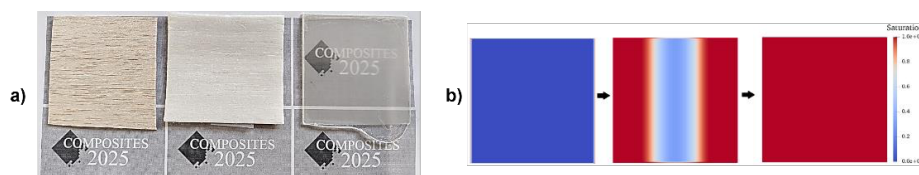


Figure 1. **a)** 5 cm square balsa wood samples (left: pristine wood, middle: delignified wood, right: TW). **b)** FE simulation of the infiltration model at different time steps.

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