ICCS25

25th International Conference on Composite Structures

Faculty of Engineering, University of Porto, Portugal

19-22 July 2022

Book of Abstracts

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Welcome Address

The abstracts collected in this book represent the proceedings of the conference ICCS25 (25th International Conference on Composite Structures) , 19-22 July 2022. This book aims to help you to follow this Event in a timely and organized manner. Papers are selected by the organizing committee to be presented in virtual/phisical format. Such arrangement is due to the effects of the coronavirus COVID-19 pandemic. The event, held at FEUP-Faculty of Engineering, University of Porto (Portugal), follows the success of the first 24 editions of ICCS. As the previous ones, this event represents an opportunity for the composites community to discuss the latest advances in the various topics in composite materials and structures.

Conference chairs

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Contents

the following mechanical characterization of cut-out test specimens. For the microscopic analysis of the foam structure, polished specimens are prepared and examined under different microscopes. Furthermore, investigations with μ-computed tomography are carried out to determine the porosity of the foam. The mechanical characterization is performed by means of tensile, compression and bending tests on suitable test specimens.

Development and characterization of in-situ sandwich panels with aluminum alloy foam core

abst. 1337
Room B035
Wednesday
July 20
12h10

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The aluminum alloy foams have been explored to be used in energy absorption applications that require lightweight structures with high strength-to-weight and stiffness-to-weight ratios, high impact energy absorbing capacity, and good damping of noise and vibration. The metal foams are usually applied as core and/or as filler of sandwich panels and thin-walled structures. The purpose of this paper is to develop in-situ sandwich panels consisting of a highly porous aluminum foam core and aluminum alloy face sheets manufactured by the powder metallurgy method in which the face sheets are bonded to the foam core during the foam formation. The samples are geometrically analyzed in 2D and 3D using X-ray microcomputed tomography to extract morphological and topological properties of the foam core, the face sheets, and the bonding between them. The mechanical and acoustic properties of in-situ sandwich panels are evaluated.

Development and characterization of aluminum alloy foam – cork hybrid structures

abst. 1338
Room B035
Wednesday
July 20
12h30

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Cellular solids and porous materials have been considered as one of the most suitable lightweight multifunctional materials for a wide range of commercial and industrial applications, e.g. in medicine, military. Their use contributes to an immediate and significant weight reduction and material savings of the components but also to multifunctionality due to their 3D cellular structures (open-cells or closed-cells). Herein, hybrid structures based on cellular materials are developed and studied by combining

open-cell aluminum foam with cork. These hybrid structures were prepared by infiltrating a mixture containing polymer-coated cork powders into the open-cell foam. The samples are geometrically analyzed using X-ray microcomputed tomography to extract morphological and topological properties of the voids and the solid phase. The mechanical, thermal, acoustic, and fire retardancy properties of these aluminum foam-cork hybrid structures are evaluated and compared with their individual components (open-cell aluminum alloy foam and agglomerated cork).

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abst. 1339
Room B035
Wednesday
July 20
12h50

Mechanical properties of the aluminum foam-filled tubes

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The research focuses on lightweight structures filled with cellular (porous) metals. Initially, their design and fabrication procedures are described. Aluminum alloy tubes of different shapes were filled (in-situ and ex-situ) with different aluminum alloy foams (e.g., open and closed-cell foams). They were subjected to mechanical loading in an extensive experimental testing program. Different types of loading (e.g., compression, bending) and velocity (e.g., quasi-static, dynamic) were considered. The deformation response, including the collapse mechanism of the foam-filled structures, has been analyzed in detail. The mechanical properties, energy absorption capacity, and strain rate sensitivity were also evaluated. It was found that the lightweight aluminum foam-filled tubes offer a stable crush performance and that their mechanical properties and deformation mechanism can be tuned for specific applications.
