Institute of Thermomechanics Seminar
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Lecture
No. 37

Czech Society for Mechanics
and Institute of Thermomechanics, CAS

invite you to a lecture and discussion within
the lecture series **Institute of Thermomechanics Seminar**

Cellular structures and materials – fabrication, properties characterisation and applications

given by

Zoran Ren, Srečko Glodež, Matej Vesenjak and Nejc Novak
University of Maribor, Faculty of Mechanical Engineering,
Maribor, Slovenia

The presentation will give a short overview of cellular materials in general. Initially, their properties, fabrication procedures and application possibilities will be discussed. Then their geometrical characterization, experimental testing and computational modelling within the finite element method of various cellular metal types will be described. The geometrical characterisation is based on the analysis of micro computed tomography scans and proper recognition of their internal cellular structure, taking into account the statistical distribution of morphological and topological properties. The results of conducted geometrical analysis provided means to develop methodology for proper 2D and 3D geometrical modelling of irregular cellular materials and consequent formation of computational models. The numerical models were validated by quasi-static and dynamic mechanical experimental tests supported by infrared thermography.

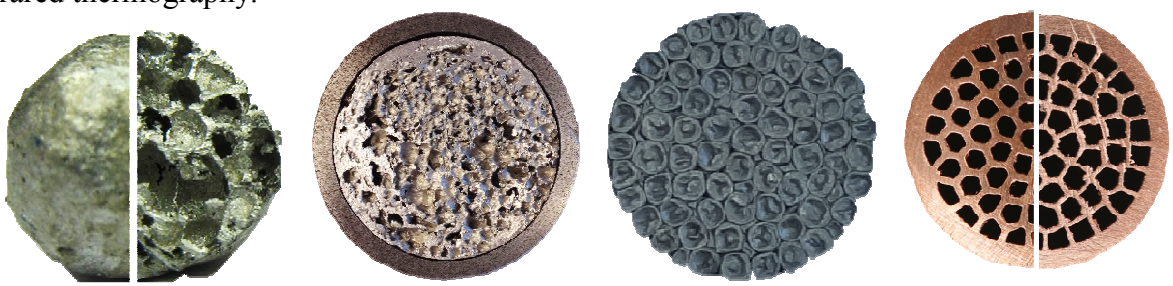

Figure 1. Different types of cellular materials.

In the next part of the presentation, auxetic cellular structures, which exhibit negative Poisson's ratio, will be discussed. Negative Poisson's ratio is a consequence of internal structure deformation. This effect is useful for many different applications to enhance properties in density, stiffness, fracture toughness, energy absorption and damping. Several 2D and 3D auxetic structures will be introduced. Experimental results of some selected auxetic structures, tested under quasi-static and dynamic loading conditions, will be presented. Furthermore, representative discrete computational models built with the beam finite elements and homogenised computational models that were validated by experimental data will be shown as well. They were

Contact persons: Radek Kolman, Hanuš Seiner

developed to explore the auxetic response at different loading conditions and material distribution (including porosity variation).

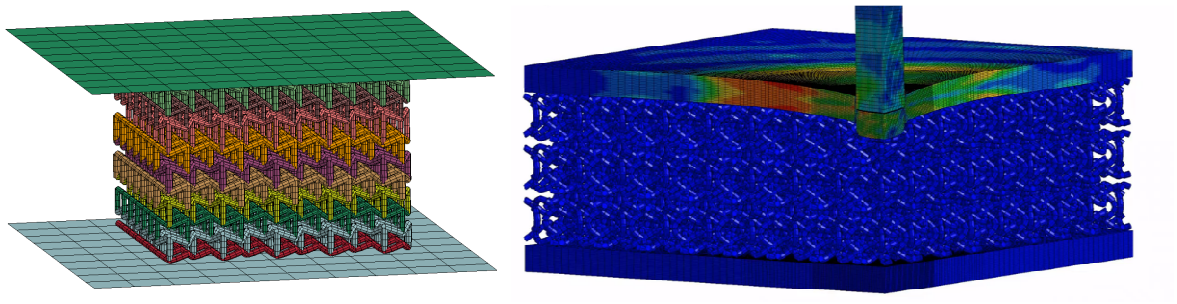

Figure 2. Testing of auxetic structures.

The lecture will be held on Friday, November 10, 2017 at 10:00 in the building of the Institute of Thermodynamics (lecture room B), Dolejškova 5, 182 00 Prague 8

Contact persons: Radek Kolman, Hanuš Seiner