

Zahájení studia - 1. březen 2025

Katedra mechaniky a materiálů (K618)

Studijní program: Dopravní systémy a technika

Školitel

doc. Ing. Daniel Kytýř, Ph.D., školitel – specialista Ing. Tomáš Fíla, Ph.D.

Téma:

Laboratorní rentgenové zobrazovací techniky s velmi vysokým časovým a prostorovým rozlišením

Doktorské téma je

okruh

Jazyk / český

Anotace:

Actual challenges in the state-of-the-art in-situ X-ray imaging can be divided into the following key goals: to increase spatial resolution, to increase temporal resolution, to reduce scanning time, to get high quality visualizations of problematic materials, e.g., low attenuation materials like biological tissues, or materials with very different phases like polymers with metal reinforcements, and to keep costs of the measurement in a reasonable range. While the technical challenges can be overcome in particle accelerators like synchrotrons with very high costs, it is extremely demanding task in versatile laboratory based X-ray systems but with application potential. The topic of the dissertation is a development of a laboratory based X-ray computed tomography system for in-situ material testing with unprecedentedly high temporal and spatial resolution. To achieve this goal, a state-of-the-art liquid anode X-ray source will be integrated together with a variety of radiation imaging systems, detectors, and in-situ devices, while all the elements will be synchronized in real-time. The system will be combined with advanced data processing and post-processing methods allowing for automated analysis of large datasets, e.g., identification and tracking of damage in the material microstructure. The capabilities of the system will be demonstrated on representative applications studying time-dependent processes in biomechanics and material engineering.

The dissertation will be performed in close co-operation and sharing of research infrastructure between Department of Mechanics and Materials FTS CTU and Department of Biomechanics ITAM CAS

Literatura:

Nurel, et. al., Split Hopkinson pressure bar tests for investigating dynamic properties of additively manufactured AlSi10Mg alloy by selective laser melting, Additive Manufacturing, Volume 22, 2018, pp 823-833, doi:10.1016/j.addma.2018.06.001.

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S.C. Garcea et al.: X-ray computed tomography of polymer composites, Composites Science and Technology, 2018, 156, DOI:10.1016/j.compscitech.2017.10.023

L. Xuekun et al.: Anisotropic Crack Propagation and Deformation in Dentin Observed by Four-Dimensional X-ray Nano-Computed Tomography, Acta Biomaterialia, 2019, 96(3), DOI: 10.1016/j.actbio.2019.06.042

Počet doktorandů / Number of doctoral students: 1

Forma studia: *prezenční*

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