

Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences

Subject

The use of indentation test to estimate fatigue damage of structural elements under cyclic multiaxial loads.

Supervisors, contact, place of research

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Project Description

Indentation test is an important tool that enables to estimate, in practically nondestructive mode, mechanical properties of materials using samples having small volumes, so it can be applied to identify local material parameters. Indentation can be particularly useful in examination of fatigue damage, that usually starts due to stress concentration from small critical regions of structural elements and microplasticity approach is applied to describe local material behaviour [1-3]. Recently many papers were published in which indentation test at micro- and nano-scale was used to identify material parameters like Young modulus, hardness, fracture resistance or even more complex materials characteristic like stress-strain curve in elastic-plastic range.

Less numerous are the papers in which the estimation of fatigue resistance and prediction of fatigue life based on indentation test are considered [4,5]. The goal of the dissertation is to propose a method that enables such an estimation. The classical fatigue tests in uni- and multi-axial stress state and cyclic indentation tests are planned to prepare the method. The micro and nanoindentation will be applied to track the fatigue damage at macro-scale and at nano-scale, at a level of single grain. The finite element method will be applied to simulate local stress state at different observation scales.

Bibliography

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