京都大学 構造材料元素戦略研究拠点セミナー

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5 階材料工学セミナー室（527 室）

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講演題目: **Theoretical strength under multiaxial loading**

Abstract :
The theoretical strength represents an upper limit to the envelope of attainable stresses and its knowledge enables us to assess the gap remaining to upper strength values of advanced engineering materials. Most of the theoretical strength calculations were performed for simple loading modes, given by a single non-zero stress (or strain) tensor component as uniaxial or isotropic tension or simple shear. On the other hand, materials used in the industrial exploitation are usually subjected to multiaxial loading.
This talk will focus on two particular examples of a superposition of simple loading modes: an axial loading of cubic crystals under superimposed transverse stresses and a shear loading under superimposed normal stress. Typical examples of the former case are stress states at the crack tip, in DAC experiments or those induced by the matrix/reinforcement incompatibility strain on the reinforcing single crystal fibers (or whiskers) in composite materials. The influence of a stress applied perpendicularly to slip planes during shear deformation of a crystal on the shear strength is also important in many deformation processes. As an example, one can consider a nanoindentation process as a combination of shear and compressive deformations in the vicinity of an indenter. On the other hand, shear strength computed as a function of superimposed tensile normal stress in a system, conveniently inclined to loading axis can be used for prediction of shear instabilities in crystals during tensile tests.
Results of the aforementioned studies were obtained from atomistic modelling using first principles computational codes based on pseudopotential approach and plane wave basis set.

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