# COMPRESSIVE STRENGTH OF PERFECT CUBIC CRYSTALS UNDER TRANSVERSE BIAXIAL STRESSES

Miroslav Černý, Petr Řehák and Jaroslav Pokluda

*Brno University of Technology, Brno, Czech Republic*

Crystals and whiskers used in the industrial exploitation are usually subjected to multiaxial loading. Despite this fact, only a few studies [1-2] were devoted to a coupling of various stress tensor components. A typical example of simple multiaxial loading is a stress induced by the matrix/reinforcement incompatibility strain on the reinforcing single crystal fiber (or whisker) in a composite material. The fibers are subjected to triaxial loading even in case of the remote (purely uniaxial) tension of the composite. Considering the biaxial stresses (transverse to fiber axis) as adjustable parameters and the axial stress as the crystal response, one can study an impact of the transverse stresses on the crystal strength. Former calculations of the compressive strength in <100> direction [3] revealed linear dependences for several studied fcc crystals.

In this work, we focus on the dependence of the uniaxial compressive stress (particularly its maximum value) on the superimposed transverse biaxial stresses for selected fcc crystals compressed along the <111> direction and on their energy profiles and crystal volumes along the deformation paths. For this purpose we employed our own relaxation procedure that was based on first principles calculations of a stress tensor. A plane-wave pseudopotential code was used for this purpose. The obtained results confirm the linear dependence of the compressive strength on the transverse stresses also for the <111> loading direction.

References:

[1] M. Černý and J. Pokluda: *Acta Mater.,* **58** (2010) 3117 – 3123.

[2] M. Černý and J. Pokluda: *Phys. Rev. B,* **76** (2007) 024115.

[3] P. Řehák, M. Černý and J. Pokluda: *Key Eng. Mater*. accepted.