Stochastic methods in microstructure analysis

Iva Karafiátová

(*Charles University, Prague*)

Stochastic models are frequently used in the field of modelling of polycrystalline materials. The overall structure itself is usually modelled by tessellations. Our focus lies mainly on understanding advanced grain characteristics such as stress within grains, grain lattice orientations and normals of grain boundaries. These characteristics play an essential role in the mechanical properties of the material.

We consider a random marked tessellation in which the marks are crystal lattice orientations, stress tensors, volumes etc. There exist well-approximating methods for modelling the unmarked tessellation. The aim is to extend these methods to fit a stochastic model to the real microstructure, i.e. the marked tessellation, in which the marks are modelled conditionally on the underlying tessellation. The model should take into account spatial dependencies, especially among the lattice orientations, which are often present. To achieve this, one needs to be able to measure and test the overall dependence of the orientations of neighbouring grains. This is the essential step of the current research.

Joint work with Zbyněk Pawlas.