

Master Thesis

Numerical Modeling and Simulation on 3D Microstructure of WC-Co Hardmetals

Introduction

The mechanical property of WC-Co composites strongly depends on the microstructure of these materials. To investigate how the local microstructure parameters influence the global mechanical behavior, the micromechanical simulation on representative microstructure models are usually used. Due to the inherent complexity in the heterogeneous microstructure, it is a challenge to create three-dimensional numerical models. At present, most of relevant numerical studies on this topic are limited to 2D or pseudo-3D cases. Therefore, a computational methodology for creating 3D microstructure models is valuable to extend the research. The objective of the thesis is to develop a methodology consisting of a set of numerical tools, which contributes to creating numerous synthetic microstructure models efficiently. The performance of proposed approach will be evaluated by simulating created models' mechanical response on a basis of statistical learning.

Your Task

- Numerical 3D microstructure reconstruction;
- FE simulation on created 3D microstructure models;
- Analysis of simulation results.

Your Qualification

- Fundamental understanding in materials science;
- Practical experience in FEA software (Abaqus, etc.);
- Good programming skills (Python, MATLAB, etc.).

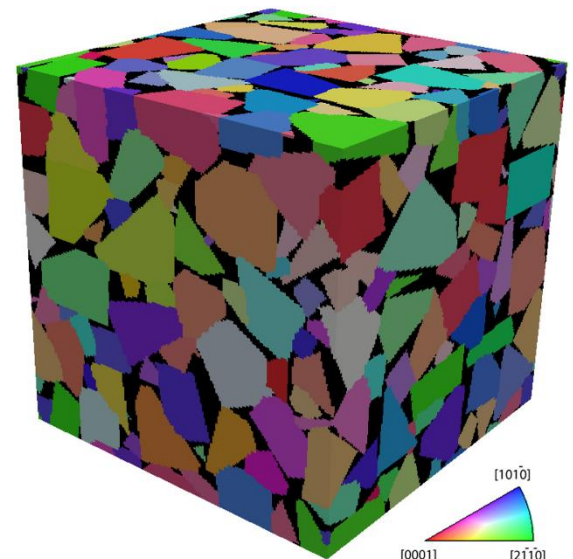
We offer

- Productive work environment and continuous support;
- Chance to applying for a PhD- and/or HiWi-position.

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Example of synthetic microstructure of WC-Co composites¹

¹Johansson, S.A., Öhman, M., Ekh, M. and Wahnström, G., 2019. CCBUILDER: a software that produces synthetic microstructures of WC-Co cemented carbides. *International Journal of Refractory Metals and Hard Materials*, 78, pp.210–218.