Aalto University
School of Engineering

COE-C2004 - Materials Science and Engineering

2021-2022 Autumn II

Case Study I, 01.11.2021

Analyze the microstructure information of the attached EBSD data of a high entropy alloy (HEA) (ebsdHEA.ctf). The focused features shall be grain size and shape distribution. Use the statistical microstructure information to generate an RVE for the investigated HEA material. For HEA materials, the grain size distribution might be grouped into two peaks, try to repeat the experimental general grain size distribution in generated RVE. You can use the 'Los Alamos FFT Writer' filter to obtain the data in the generated RVE.
(http://www.dream3d.io/Filters/ImportExportFilters/LosAlamosFFTWriter/ as DREAM3D is improving its website every day, if this link does not work, please google "DREAM3D Los Alamos FFT Writer")

Expected results:

- The detailed analysis of the grain size and shape distribution functions and fitting.
- The procedure and results of the RVE model generation.
- An algorithm to analyze the grain size and shape distribution of the generated RVE.
- An algorithm or workflow to optimize the quality of the representativeness of the RVE model.
- Any automation algorithm of the entire process.

You might get some further information from the following papers:
[1] W. Liu, J. Lian, N. Aravas, S. Münstermann, A strategy for synthetic microstructure generation and crystal plasticity parameter calibration of fine-grain-structured dual-phase steel, International Journal of Plasticity 126 (2020) 102614.

Group work is allowed for Case Study 1. You could form a group with max. two additional peers to solve the task and provide your solution. For the convenience of grading, still submit your report individually, but indicate who your group member is. In addition, clearly state the individual contributions of each group member.
All information has been given above. Please solve the task with your group. As an additional case study to obtain extra points in the COE–Materials Science and Engineering course, no more additional supports/resources would be given.

Due date: 18:00, 19.12.2021.
Contact: MyCourses 'General discussion' channel.

Prof. Dr.-Ing. Junhe Lian junhe.lian@aalto.fi Tel.: +358 50 477 0765
Adv. Manufacturing and Materials | Department of Mechanical Engineering | School of Engineering | Aalto University
Mail address: P.O. Box 14200, FI-00076 Aalto, Finland; Visiting address: Puumiehenkuja 3, 02150 Espoo, Finland