Master thesis announcement

Development of new alloying systems suitable for tooling applications

Background and aim
Traditionally, steels that are manufactured by various metallurgical routes such as casting, forging or rolling, or via Powder Metallurgical methods are being utilized for demanding applications such as tooling. The requirements on combination on high strength, wear and corrosion resistance, as well as thermal stability set by such applications can be extremely challenging for most material families. High Entropy Alloys (HEAs) consist of four or more principal alloying elements, for which the high mixing entropy allows the formation of stable solid solution. The mechanical and physical properties of such materials are being reportedly exceeding the performance of conventional alloys, under certain conditions.

The aim of the present investigation is to determine if HEAs can be considered as candidate materials for tooling applications in terms of properties and performance. Where do HEA position in respect to steels when considering all the relevant properties?

Tasks
- Literature research on HEAs – relevant to tooling applications
- A methodology to design/select candidate elements for HEAs, based both theoretically (CALPHAD modeling, first principles calculations) and experimentally
- Experimental evaluation of candidate HEAs in respect to their properties, relevant for tooling applications
- Reporting

Timing and reimbursement
The project should start as soon as possible in 2018 and the duration is 20 weeks, full-time. The student will be reimbursed.

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