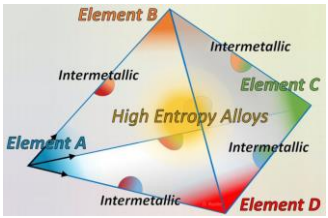
Institute of Materials Science, Joining and Forming
Kopernikusgasse 24/I, 8010 Graz

Announcement of a Master's Thesis, 3.2.2022
3D-printing of multi-component alloys by multi-wire PW

Description



Metallurgical Materials Science and Alloy Design - High Entropy Steels (dierk-raabe.com)

Multi-component alloys emerged as a new material class in less than 30 years. Extraordinary toughness, high-temperature oxidation resistance, and notably good catalytic properties make them very attractive for further development. However, their production route is not well-defined and notably complex, limiting their application. If you are motivated by the emerging research field of multi-component alloys, also known as low or high entropy alloys, and additive manufacturing (AM), you might want to study the feasibility of producing novel multi-component alloys using our new plasma welding device. The machine is equipped with two wire feeders. We will use one Co-based wire to be alloyed with another Fe-Cr-based wire or a Ni-Cr-based one. The final chemical compositions should be either Fe-Cr-Co or Ni-Cr-Co alloys. Afterwards, the Microstructure and mechanical properties of the produced materials will be evaluated. We aim to provide a relatively easy way production route for these novel alloys with notorious mechanical and functional properties.

Objectives

- To develop the AM process for the production of integer multi-component alloy structure using the multi-wire plasma device
- To characterize the microstructure and mechanical properties of the produced parts

Tasks

- Deposition trials and process development: feasibility studies and determination of parameters
- Microstructure investigation using light optical microscopy and scanning electron microscopy
- Mechanical testing using a tensile machine, Charpy hammer and hardness

Organization

Supervisor: Prof. Norbert Enzinger (norbert.enzinger@tugraz.at), Dr. Ricardo Buzolin (Ricardo.buzolin@tugraz.at)
Prerequisites: Master student of Advanced Materials Science or Mechanical Engineering (MB, WIMB)
Duration: starting in March 2022 for min. 6 months
Location: Joining Group and Modelling and Simulation Group, Kopernikusgasse 24/I, 8010 Graz
Reward: € 2.500 + € 500 performance bonus for an excellent success

Further information

- For further information, please get in touch with the secretariat of the institute or the supervisor.
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Modelling and Simulation
IMAT