

Steel-bonded “green” hardmetals for wear applications

Summary

Research and development of novel “green” WC-based hardmetals with Fe-based binders as alternative for widely used Co binders. Improving understanding of structure formation of novel hardmetals during high temperature treatment. Developing production technologies (conventional and also additive manufacturing) of “green” WC-based hardmetals.

Research field: Mechanical Engineering
Supervisor: Dr. Kristjan Juhani
Availability: This position is available.
Offered by: School of Engineering
Department of Mechanical and Industrial Engineering
Application deadline: Applications are accepted between September 01, 2021 00:00 and September 30, 2021 23:59 (Europe/Zurich)

Description

WC-Co hardmetals are widely used as cutting tools and wear resistant parts. High price, limited availability and toxicity of cobalt motivates researchers and material engineers to find alternative binder systems for WC-based hardmetals. Therefore the motivation of planned doctoral study stems from: (1) raw materials supply and price and (2) healthcare and environmental safety considerations. Both are considered in Strategic Research Agenda of EuMaT. Substitution of critical raw materials (CRM) and recycling will be essential in the future manufacturing value chain. The proposed doctoral study is related to advanced wear resistant PM materials for a applications in metallic materials processing, in particular “green” WC-based hardmetals bonded with Fe alloys.

Goals of the work are as following:

- improving understanding of the structure formation processes during the preparation and hot consolidation (sintering) of starting powders of Fe-alloys bonded WC-based composites (hardmetals)
- engineering and characterization of Fe-alloys bonded WC-based hardmetals with structural strength and wear performance comparable with Co-bonded ones in conventional conditions and with better properties in corrosion conditions in a wide range of temperatures
- development of industrially applicable fabrication technologies (both conventional and additive manufacturing) for production of prototypes and products from developed ceramic-metal composites

Applicants should fulfil the following requirements:

- master's degree in materials engineering and preferably experience in the field of hardmetals and cermets



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