Proposal for Master Thesis work

Design of robust sintering process of Cu bronze powder for grinding application

Grinding is a metal cutting process using tools with multiple cutting edges provided by randomly bonded abrasive grits of natural and/or synthetic origin which remove material at high speed. Metal-bonded grinding wheels use the metal bond to hold the abrasive grit (diamond etc.) for high performance applications. The high thermal conductivity, strength and wear resistance of Cu bronze makes it an interesting candidate for the metal bond. The raw materials are used in the powder form. The production of grinding wheels includes mixing of the ingredients (metal bond powder, abrasive grits, additives etc.), molding, sintering and finishing.

The thesis work will be focused on design of the robust sintering process when Cu bronze powder is used as a metal bond. The main objectives are to reduce the powder surface oxides and tailor the strength and porosity of sintered components. Based on the Cu bronze powder surface characterization (by XPS and HRSEM+EDX) and thermodynamic calculation data, a suitable reducing atmosphere(s) for the sintering of the components of interest will be proposed. Sintering trials will be performed using dilatometry and laboratory furnace equipment, and the effect of sintering atmosphere will be evaluated using relevant techniques.

The thesis work will be performed at the Department of Materials and Manufacturing Technology under the supervision of Assoc. Prof. Eduard Hryha and Dr. Ruslan Shvab. The applicant will have the opportunity to work closely with R&D team of 3M Sweden AB (Västervik) and to experience the product development from raw material to final product. There is also a possibility to participate in the grinding testing at Norrköping to evaluate the product performance.

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