Continuous compound casting of Cu-Al products

Production of metallurgically bonded bilayer rods

Motivation

In the last decades, academic and industrial research and development activities focused on hybrid structural components. The idea to achieve load-adjusted and cost-optimized components is the combination of specific mechanical, physical and chemical material properties within a single part. This leads exemplarily to an increased strength and corrosion resistance as well as to a reduced weight. Against the backdrop of a growing electrification of consumer goods and demands for weight reduction, hybrid components consisting of aluminum and copper alloys are of great interest. The continuous compound casting represents a material and energy efficient technique for the fabrication of metallurgically bonded, bilayer semi-finished products. Within the present project, a vertical continuous compound casting process for the production of rotationally symmetric Cu-Al hybrid rods is developed and the interface formation investigated.

Figure 1: Continuous casting machine at TUM

Solution approach

Compound semi-finished products consisting of brass CuZn37 and aluminum AA7075 or AA6060 are fabricated using the vertical continuous casting technology. The diffusion driven formation of a cohesion between the joining partners is controlled by the alloying elements zinc and magnesium and by the process management. In order to understand the complex relations between process parameters, alloy composition and resulting interface character, experimental investigations as well as process simulation and structural modelling are conducted.

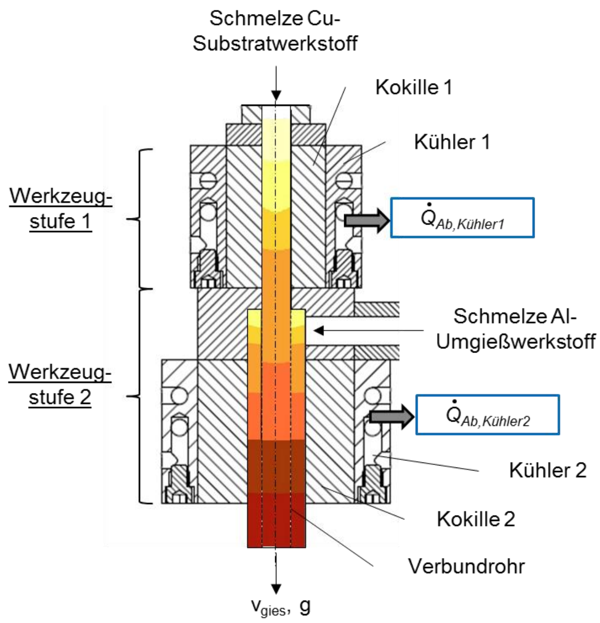

Figure 2: Sheme of vertical continuous compound casting of Cu-Al bilayer rods

Results and Outlook

Pre-experiments of static compound casting of pure copper and pure aluminum showed the feasibility of the formation of a bilayer compound with a cohesive interface character. The formation and growth of intermetallic phases can be controlled by the thermal process conditions. Future research activities will focus on the transfer to a continuous casting process. Furthermore, the thermomechanical post-processing of bilayer Cu-Al rods will be investigated.

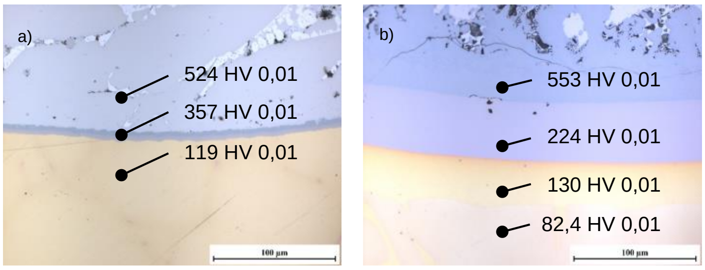

Figure 3: Interface of a Cu-Al compound

Thomas Greß, M.Sc.
Walther-Meißner-Straße 4
85748 Garching

Tel. +49 89 289 13 980
Fax +49 89 289 13 738
thomas.gress@utg.de
www.utg.de

Förderung: DFG

Partner: Institut für Metallurgie (IMet)
Technische Universität Clausthal