Thermophysical Properties of Selected Nickel-Based Superalloys by Voestalpine BÖHLER Edelstahl GmbH and Co KG Measured with an Electromagnetic Levitation Apparatus and a Furnace Rheometer System

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Experimental data on thermophysical properties, like surface tension and viscosity of liquid alloys, are essential input parameters for computer simulations to model production processes in conventional steel industry as well as novel fields of technology like additive manufacturing. At voestalpine BÖHLER Edelstahl, the goal of these simulation activities in research and development is to gain a deeper insight into the production processes and consequently support their optimization (e.g., atomization for additive manufacturing powders) and/or improvement of the final product's properties. Surface tension and density of liquid steels and alloys are obtained in house by using a terrestrial electromagnetic levitation (EML) apparatus. The EML is supplemented by a commercial high temperature furnace rheometer system (Anton Paar FRS) to determine viscosity.

In this talk, results from EML and FRS measurements on selected common Nickel based superalloys by voestalpine BÖHLER Edelstahl will be presented and compared to each other. The material class of Nickel based superalloys was chosen due to their clear and detailed specifications required for aerospace applications. The availability of those material data is not only beneficial for basic research to validate fundamental models to predict thermophysical properties based on the chemical composition. The data can also facilitate further material comparisons as well as simulations of subsequent manufacturing processes performed at customers' where BÖHLER alloys are used, e.g., selective laser melting of additive manufacturing powders (BÖHLER AMPO).

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