



Contribution ID: 18

Type: Oral Presentation

## A Metamodel for VAR Processing of Alloy 718

*Monday, 23 September 2024 14:30 (20 minutes)*

Modelling the Vacuum-Arc-Remelting (VAR) of NiFe-Based alloys like alloy 718 is motivated by its potential role in the further development of the process. It offers insight in the complex interaction of fluid mechanics and thermodynamics in a process which is experimentally hard to monitor. Nonetheless the numerical description itself requires a full definition of relevant boundary conditions which are not known per se and have to be estimated or determined by inverse modelling like e.g. parameters which determine the heat extraction from the ingot to the crucible. This makes it especially hard to model the process with a variation of the process parameters as boundary conditions are potentially and likely influenced by it.

The development of a metamodel for the remelting of alloy 718 by VAR therefore attempts to derive suitable boundary conditions and to provide a comprehensive numerical description in dependency of processing parameters. The development is based on the experimental investigation of a set of industrial sized VAR-ingots produced with different melt rates and varying helium cooling conditions. Individual calculations for each parameter set have been carried out using the commercially available software MeltFlow-VAR. Relevant parameters like the ones concerning the extraction of heat are determined by inverse modelling and validating the results against experimentally pool profiles which are evaluated from the part of the ingot processed in the steady state. The individually obtained parameters form the base of the metamodel that relates them to the set process parameters. The summarizing cross-validation of the metamodel with the individual pool profiles results in good agreement within the available data set.

### Speaker Country

Deutschland

**Primary author:** Dr HILBINGER, Michael (Neue Materialien Fürth GmbH)

**Co-authors:** Prof. KÖRNER, Carolin (Neue Materialien Fürth GmbH); Dr KNOP, Stephan (VDM Metals International GmbH); Mr STEINHOFF, Matthias (VDM Metals GmbH); Dr FISCHER, Jutta (VDM Metals GmbH); Dr ALVES, Helena (VDM Metals International GmbH)

**Presenter:** Dr HILBINGER, Michael (Neue Materialien Fürth GmbH)

**Session Classification:** Session 1

**Track Classification:** Primary and Secondary Melt Processing including VIM, VAR, ESR, EBCHR, EIGA, Plasma Melting, Ingot Casting, Centrifugal Casting