Contribution ID: **5** Type: **Oral Presentation**

# The Role of Solidification Irregularities in Freckle Formation

*Monday, 23 September 2024 15:30 (20 minutes)*

Several detailed models have been developed to account for the formation of freckles in conventional ingots, remelted ingots and in single crystal castings, accounting for the effect in titanium alloys, steels, superalloys and aluminium alloys as well as in model laboratory systems based on aqueous solutions or low melting point alloys. They are based on the concepts of inter-dendritic fluid flow through the solidifying dendrite network, driven by buoyancy forces developed by the density differences in the liquid arising from segregation of the alloy elements. In some models the formation process is held to be assisted by fluid flow in the liquid ahead of the liquidus. Following experimental verifications in laboratory conditions they have been used for both alloy design proposals and in establishing melting and casting parameters for industrial processes. In this work we examine the result of applying the models to industrially remelted ingots in various alloy compositions. The conclusions indicate that whilst the models produce satisfactory indications of freckle flow in the ideal solidification structures, the solidification irregularities formed the local deviations in process parameters generally present in industrial practice play an overriding role in determining the presence or absence of freckles in the final ingot product

## Speaker Country

Canada

**Primary authors:** Dr MITCHELL, Alec; Dr HANS, Stephane (Aubert Duval Cie)

**Presenter:** Dr MITCHELL, Alec

**Session Classification:** Session 1

**Track Classification:** Casting and Solidification of Liquid Metals