

# Understanding the Evolution of the Microstructure in Melt-Conditioned Direct-Chill Cast Al Alloys

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Present work focuses on understanding the solidification mechanism responsible for the grain-refinement in melt-conditioned direct chill (MC-DC) cast Al-alloy. It has been found that the melt-conditioning performed by stirring the liquid above the solidification front using a rotor–stator type melt-conditioning device, results in substantial fragmentation of dendrites due to forced convection and thermo-solutal distribution across the billet sump. Results also indicate that an isothermal region is created in the MC-DC regime of the billet sump, which further enhances the nucleation and restricts growth of the  $\alpha$ -Al phase. The forced convection together with the solute transport lead to catastrophic dendrite fragmentation.

*Keywords* Alloy; Aluminum; Billet; Casting; Dendrite; Fragmentation; Microstructure; Nucleation.