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Thermal simulation of continuous casting solidification process for a 2205 duplex stainless steel

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ABSTRACT

In this paper, based on the similarity in terms of heat transfer, the effects of continuous casting process parameters on a 2205 duplex stainless steel slab solidification process and its macro-structure were studied by a the thermal simulation technique of slab solidification process. The technique reproduces the heat transfer process of the crystal growth during the slab solidification course and simulates the solidification course of 10 tons of continuous casting slab in the laboratory to research the solidification process and structure evolution by the hectogram metal in the laboratory. The idea that broke through the traditional thermal simulation method of geometric similar. For 2205 duplex stainless steel slab, the solid-phase thermal resistance of slab shell was a mainly thermal transfer resistance in the secondary cooling zone. The effect of forced convection, which was generated by square-wave mechanical stirring, on grain refinement of 2205 duplex stainless steel (DSS) slab was investigated with thermal simulation device for the continuous casting dendrite growth. The results indicated that not only the columnar to equiaxed transition (CET) was gradually promoted but also the equiaxed grain ratio was refined with the forced convection increasing. And the forced convection increasing has a significant influence on solidified structure at the lower convection intensity. Analysis results of the experiment show that the influence of forced convection on the solidification structure is by the means of promoting the solute diffusion in the front of the interface of S/L and the heat transfer in the liquid.

KEYWORDS: duplex stainless steel, continuous casting, CET, solidification, thermal simulation, forced convection, grain refinement