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Validation of electroslag remelting process simulation of an industrial scale martensitic stainless tool steel ingot

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A martensitic stainless tool steel was remelted by a Pressure Electroslag Remelting (PESR) process with deliberate cancellation of the remelting just before normal hot-topping operation. Enabling evaluation of the ingots melt pool profile, dendrite angle and spacing, and macrosegregation during normal remelting conditions. A longitudinal cross section (500x500 mm) from the top of the 500 mm diameter cylindrical ingot was extracted from its transverse midpoint and macro-etched. Microstructural characterization of the solidification structure was carried out using light optical microscopy, supplemented by scanning electron microscopy, and macro segregation by optical emission spectroscopy and combustion infrared detection. The results from the ingot cross section were compared with predictions made by the commercially available modelling software package, MeltFlow-ESR™.

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