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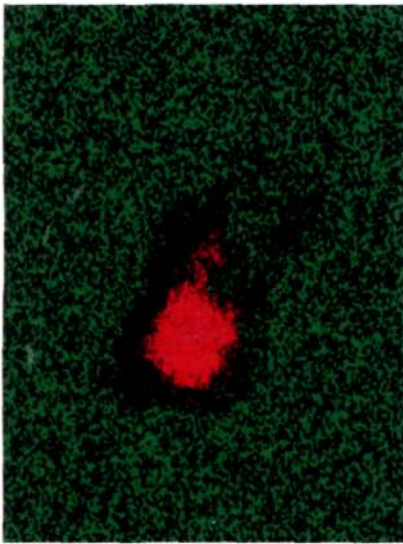
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Cover Photo:

This front cover image reveals the surface vanadium element distribution map of the vanadium rich inclusion particle, which exists in the inner arc of continuous casting by means of SEM surface scanning. More details can be found in the article by M. M. Wu and co-workers on page 534.

Publishing company:

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A new double calcium treatment method is proposed according to industrial experiment. In the new process, the evolution of inclusion is analyzed and the controlling standard of T.[Ca]/T.[O] ratio for calcium treatment is discussed. In order to get a good calcium treatment result, T.[Ca]/T.[O] ratio should be controlled above 0.91, and the ratio between 0.91 and 1.25 is suitable in present work.

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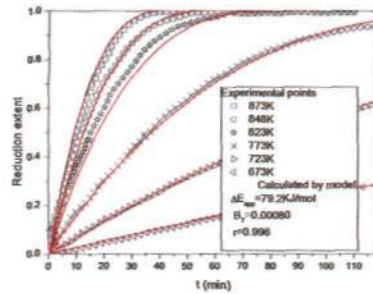
A new kinetic model has been
developed for reduction of metal
oxides with hydrogen under both
isothermal and non-isothermal
conditions. This model can describe
the kinetics of single reductive
reaction and double reductive
reactions by considering the
diffusion and chemical reaction
controlling mechanisms. The model
predicted curves agree well with
the experimental results from the
literatures.
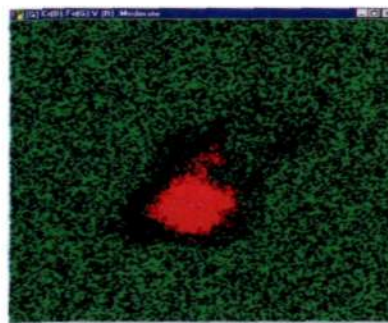
The reason of 50Mn2V transverse
cracking is studied by a series of
means, optical metallographic,
SEM for microstructure, fracture
surface and inclusions and insitu
analysis for element segregation.
In summary, internal gas pressure
should be the dominant factor that
leads the transverse embrittlement
of continuous casting blank, while
inadequate microstructure, internal
stresses, element segregation, and
defects play an ancillary role.
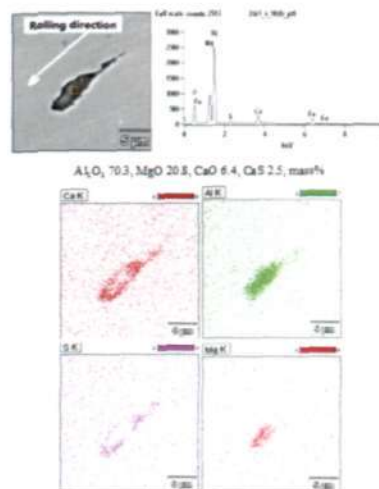
The first type of duplex CaS
bearing inclusion forms due to CaS
precipitating directly surrounding solid
inclusion core; the second type is as
modified calcium aluminates react
with dissolved sulfur and aluminum.
During rolling, the outer CaS rich
layer of the first type inclusion is
easily separated from the inner core
while the later one performs a better
deformation.

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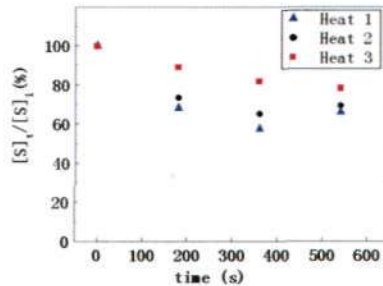
The addition of CaS into slag can reduce [S] loss in the molten steel. At time $t = 360$ s, the sulfur content in the molten steel decreases to $< 60\%$ of the initial sulfur content, when no CaS is added into the slag (Heat 1), but the sulfur content in the molten steel decreases only to 80% of the initial sulfur content, when 5% CaS is added into the slag (Heat 3). The reason may be that after addition of CaS, the content of reaction product CaS in the slag has been increased, which suppressed the desulfurization reaction.
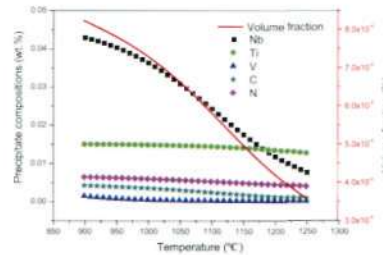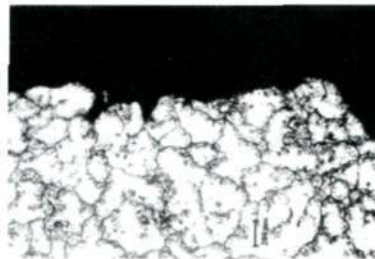
A simple theoretical model which is based on the solubility products of the individual nitrides and carbides was proposed to predict the equilibrium composition of multicomponent precipitates in Nb–V–Ti bearing steel. And the volume fraction of the second phase particles in equilibrium at given temperature can also be obtained by the developed model.

Macrosegregation in dendritic equiaxed structure during the early stages of solidification of Al-4.5%Cu alloy has been studied experimentally. The metallurgical study includes macro-microstructure evaluation, measurements of grain size of equiaxed crystals, and macrosegregation analysis. In addition to the experimental work, there is a mathematical study which contains a complete derivation of local solute redistribution equations based on Fleming's approach under different solute diffusion mechanisms in the dendritic solid.
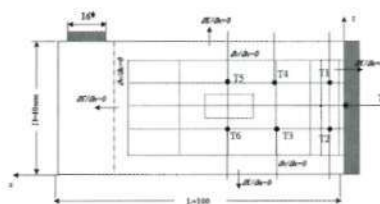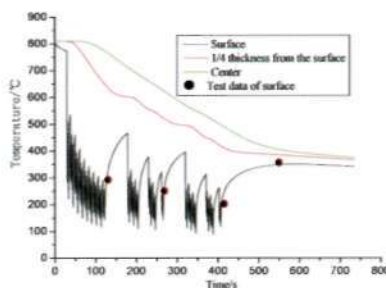
Contents

The mathematical model of derived solute equations in Part I for equiaxed dendritic solidification with melt convection streams and thermal is applied numerically to predict macrosegregation distributions with different diffusing mechanisms in dendritic solid. Numerical and experimental results are present for solidification of a Al–4.5% Cu alloy inside horizontal rectangular cavity at different superheats.

New online pre-hardening equipment for quenching die steel has been developed. Based on the equipment, different online quenching processes of 3Cr2NiMo die steel plate with the thickness of 130 mm were performed by numerical simulation and production experiments. Under the optimal process, the tempering hardness difference was less than 3HRC in the whole 3Cr2NiMo steel plate, and there were no cracks in the steel plate.