

论文

700-1000℃ 间含Nb钢铸坯的延塑性降低与Nb(C,N)析出

王新华;昌波;李景捷;张立;叶锦渭

北京科技大学;北京,100083;北京科技大学;北京,100083;北京科技大学;北京,100083;宝山钢铁公司;上海,201900;宝山钢铁公司;上海,201900

摘要: 在 1×10^{-3} / s应变速率下对含Nb钢连铸坯试样的高温延塑性进行了测定.在温度降至1100℃以下的变形试样中Nb (C, N) 开始由 γ 晶中析出, 1000-950℃之间析出的Nb (C, N) 较粗大并在钢中零散分布;温度降至900℃左右时, 大量微细的Nb (C, N) 在 γ 晶界和晶粒内析出, 尺寸平均为5-8nm, 间距在30nm左右, 造成了 γ 相区低温域含Nb钢延塑性的急剧减少;温度降至800℃时, 先共析铁素体开始在 γ 晶界析出, 钢的延塑性继续降低.由于含Nb钢试样共析转变的推迟, 与不含Nb钢相比, 其第III脆性温度域向低温延伸.

关键词: 含铌钢 连铸坯 热塑性 Nb (C, N)

DUCTILITY LOSS AND Nb(C,N) PRECIPITATION IN Nb-CONTAINING STEEL SLAB IN THE TEMPERATURE RANGE FROM 700 TO 1000℃

WANG Xinhua;CHANG Bo;LI Jingjie (University of Science and Technology Beijing, Beijing 100083), ZHANG Li;YE Jinwei (Baoshan Iron and Steel Co., Shanghai 201900)

Abstract: Hot ductility of the continuously casted Nb-containing steel slab was measured under the strain rate of 1×10^{-3} /s. It was found that in the fractured specimens,Nb(C,N) precipitation took place when temperature decreased to below 1100℃. The Nb(C,N) particles precipitated in the temperature range from 1000 to 950℃ were coarse and randomly distributed in the specimens. When the temperature was lowered to 900℃, the precipitation content of Nb(C,N) reached maximum and fine Nb (C,N) precipitates were found both along γ grain boundaries and inside the grains with mean particle size of 5-8 nm and interparticle spacing of about 30 nm. As the result of Nb(C,N) precipitation, the hot ductility of the steel was significantly reduced in the lower temperature region of γ single phase. As the temperature decreased to below 800℃, film-like proeutectoid ferrites formed along the γ grain boundaries that further reduced the steel ductility. The eutectoid transformation of the Nb-containing steel was delayed compared to the steel without Nb. This leads to the extension of the low ductility of the steel to the lower temperature.

Keywords: Nb-containing steel continuous cast slab hot ductility Nb(C N)

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通讯作者:

作者简介:

作者Email:

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