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热轧带钢冷却过程奥氏体相变与温度耦合模型

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摘 要：为精确模拟奥氏体相变行为，建立一种新的预测模型，该模型通过考虑潜热影响的板带轧后二维温度场将相变体积分数和温度联系起来进行耦合计算。冷却过程释放的潜热通过双亚点阵模型进行计算，计算结果通过在热分析仪STA449C上进行DSC实验验证。在相同的变形条件下，热模拟实验在Gleeble-3800热力模拟试验机上进行。相变与温度耦合模型的计算结果与连续冷却相变体积分数模型的计算结果相比更接近实测结果。研究结果表明：随着碳含量的增大，潜热释放量也明显的增大，当碳含量(质量分数)高于0.45%时，潜热释放量也趋于稳定；通过对计算结果和实测数据系统的比较，证明相变与温度耦合模型的优越性和精确性，耦合模型与现有模型相比，铁素体、珠光体和贝氏体的计算结果精确度最高分别提高24.77%，21.07%和31.85%。

关键字：热轧带钢；奥氏体；相变；潜热；温度分布；耦合

Model of austenite transformation and temperature coupling for hot rolled strip during cooling process

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Abstract: In order to simulate austenite transformation process exactly, a new model for austenite transformation volume fraction and temperature coupling in the two-dim unstable temperature fields considering latent heat was established. The latent heat releasing during cooling process was calculated by two-sublattice thermodynamic model and the results were testified by heat transfer tests performed on STA449C thermal analyzer (DSC). The experiment was carried out on a Gleeble 3800 thermomechanical simulator under the similar deforming conditions. The results show that the latent heat increases drastically with increasing carbon content and gradually levels off at about 0.45% carbon. By comparing volume fraction of the three phases obtained by kinetic model, temperature coupling model and experiment, it is indicated that the coupling model has superiority and the calculation accuracy of the three phases can be maximally increased by 24.77%, 21.07% and 31.85%, respectively.

Key words:hot rolling strip; austenite; transformation; latent heat; temperature distribution; coupling

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