



## 论文摘要

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### 侧喷加热铝材退火炉内流场与温度场数值模拟

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**摘要:** 采用热传导模拟实验研究铝卷层与层之间接触热阻对铝材退火的影响。根据实验结果分析, 改变现有径向加热铝材退火炉内循环空气的流动方向, 采用轴向对流换热方式, 设计侧喷加热铝材退火炉, 建立侧喷加热铝材退火炉三维仿真模型。利用CFD软件FLUENT, 采用标准k-ε湍流模型, 对侧喷加热铝材退火炉内气体流动和传热问题进行数值模拟研究。研究表明: 与径向传热方式相比, 轴向传热方式退火速度快, 铝卷芯部与外部表面之间的温差小; 侧喷加热铝材退火炉内气体流动顺畅, 对流换热均匀, 炉温温差控制在-1~1 K, 满足退火工艺对炉温均匀性的要求。

**关键字:** 侧喷加热铝材退火炉; 流场; 对流换热; 温度场; 数值模拟

### Numerical simulation of flow and temperature field in side-blown aluminum annealing furnace

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**Abstract:** The effect of thermal contact resistance between aluminum coil for aluminum annealing was investigated by simulation experiment of heat conduction. Based on this interpretation, side-blown aluminum annealing furnace was designed by changing flow direction of air cycle in furnace and adopting axial convection heat transfer. Simulation model of side-blown aluminum annealing furnace was established, numerical simulation of turbulent flow and heat transfer in furnace were done by using CFD software i.e., FLUENT and standard k-ε turbulence model, flow and temperature fields in furnace were illustrated. The results show that, compared with radial heat transfer, the efficiency of annealing is higher and temperature difference between aluminum coil's internal and external surface is small by using axial heat transfer. The flow in furnace is fluent, convection heat transfer is uniform, and the temperature difference of furnace gas is -1 to 1 K and can satisfy the annealing technology's desire about the uniformity of furnace gas's temperature.

**Key words:** side-blown aluminum annealing furnace; flow field; convection heat transfer; temperature field; numerical simulation

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板坯连铸内外复合冷却流场和温度场耦合数值模拟

异形坯连铸过程流场与温度场耦合三维数值模拟

铝板坯充型过程流场与温度场的耦合数值模拟

圆坯结晶器电磁搅拌过程三维流场与温度场数值模拟

采煤机喷雾嘴内流场数值模拟

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