

材料科学与工程

## 离心渗铸充型过程中伴随有瞬态固化与再熔现象的流场变化规律

胡国新, 杨丽辉, 田芩蔚

上海交通大学机械与动力工程学院, 上海 200030

收稿日期 2003-1-24 修回日期 2003-5-12 网络版发布日期 2008-9-1 接受日期

**摘要** 针对离心渗铸工艺中熔体浇注温度太高会带来铸件冶金质量下降问题, 在充型过程中一般会发生金属熔液的瞬态固化与再熔现象, 建立了旋转多孔介质内伴随有瞬态固化与再熔现象的渗流传热理论模型. 通过理论分析获得了离心渗铸充型过程中瞬态压力分布计算公式, 建立了不同区域界面的移动速率与温度间的耦合关系, 分析了流场变化规律. 结果表明: 渗透前沿界面推移速度主要受离心渗透压力即渗透动力学因素的影响, 而再熔界面推移速度主要受热导率和金属相变特性即材料热力学因素的影响, 多孔预型体内发生的瞬态固化与再熔是决定充形过程中渗铸复合层能达到的最大厚度的重要因素.

**关键词** [离心渗铸](#) [固化](#) [再熔](#) [传热](#) [多孔介质](#)

分类号

## INFILTRATION OF MOLTEN ALUMINUM WITH TRANSIENT SOLIDIFICATION AND REMELTING IN CENTRIFUGAL CASTING PROCESSES

HU Guoxin, YANG Lihui, TIAN Qinwei

### Abstract

In this work, a fully coupled fluid flow and heat transfer model was developed to analyze molten aluminum infiltration with transient solidification and remelting through a fibrous preform in a centrifugal force field. The pressure, temperature and velocity distribution in the preform and the solid volume fraction profiles were presented for different conditions. The results show that the fibrous volume fraction and the rotational speed of equipment were very influential on transient solidification and remelting in the centrifugal force field. The length of solidification zone and its solidification rate increased with the advance of infiltration interface. An increase of rotational speed and porosity resulted in an increase of composite temperature, and a decrease of the solid volume fraction, as well as the length of solidification zone during the centrifugal casting process.

**Key words** [centrifugal infiltration casting](#) [solidification](#) [remelting](#) [heat transfer](#) [porous media](#)

DOI:

通讯作者 [胡国新 guoxinhu@online.sh.cn](mailto:guoxinhu@online.sh.cn)

### 扩展功能

#### 本文信息

▶ [Supporting info](#)

▶ [PDF\(545KB\)](#)

▶ [\[HTML全文\]\(0KB\)](#)

▶ [参考文献](#)

#### 服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [复制索引](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

#### 相关信息

▶ 本刊中 [包含“离心渗铸”的相关文章](#)

▶ 本文作者相关文章

· [胡国新](#)

· [杨丽辉](#)

· [田芩蔚](#)