

研究论文

6201合金管材连续流变扩展挤压成形过程的数值模拟和实验研究

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**摘要:** 数值模拟和实验研究了6201合金管材连续流变扩展挤压成形过程中的温度场分布和熔体流动规律。结果表明,在连续流变扩展挤压6201合金管材过程中,辊--靴型腔中的合金等温线向轧辊侧偏移,随着浇注温度的升高半固态区间逐渐下移;在辊--靴型腔中合金熔体服从牛顿流体的层流运动规律,从工作辊表面向靴表面速度依次递减,在靴表面速度为 $0\text{ m}\cdot\text{s}^{-1}$ ;在扩展挤压模中合金呈辐射状逐层填充扩展腔,并发生分流--汇合流动,呈现出均匀的层流流动,在模具中心和分流孔流动速度最大,并逐渐向侧壁递减;与分流孔中心位置和焊合部位对应的成形管材横断面流线密集,在两者之间出现一个流线舒缓的过渡地带;制备6201合金管材的合理浇注温度范围为750--780℃。

**关键词:** 材料合成与加工工艺 流变成形 扩展 管材 半固态 温度

Simulation and Experimental Research on Continuous Extending Rheo - extrusion Process for Producing 6201 Alloy Tube

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**Abstract:** Simulation and experimental investigation of temperature field distribution and metal flow behavior of 6201 alloy were conducted in this paper. The results show that during extending rheo - extrusion process, the isothermal lines of alloy deviate to the roll side in the roll - shoe gap, and semisolid region moves down little by little with the decrease of pouring temperature. Alloy melt in the roll - shoe gap flows by Newton laminar fluid law, and the velocity decreases gradually from the roll surface to the shoe surface where the velocity reaches  $0\text{ m}\cdot\text{s}^{-1}$ . Alloy melt fills the extending cavity with a radial pattern layer by layer, and then it splits and concentrates. It also exhibits homogenous laminar flow. The flow velocity is maximal at the centers of the mould and the branch holes, and decreases gradually to the side wall. The flow lines on the cross section of the tube corresponding with the branch holes center and the welding region are dense. But there is a transitional region where the flow line is sparse. The proper pouring temperature for producing 6201 alloy tube is between  $750^{\circ}\text{C}$  and  $780^{\circ}\text{C}$ .

**Keywords:** synthesizing and processing technics rheoforming extending tube semisolid temperature

收稿日期 2010-09-29 修回日期 2010-11-20 网络版发布日期 2011-02-25

DOI:

基金项目:

国家高技术研究发展计划项目2007AA03Z111、国家自然科学基金重点项目和面上项目(51034002, 50974038)和中央高校基本科研业务费N090502003资助。

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