



## 论文摘要

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### Al-Mg-Sc合金热压缩变形的流变应力行为

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**摘要:** 采用热模拟试验对1种Al-Mg-Sc合金进行等温热压缩实验, 研究该合金在变形温度为300~450 °C, 应变速率0.001-1 s<sup>-1</sup>条件下的热压缩变形流变应力行为。结果表明: 该Al-Mg-Sc合金在变形温度为300 °C, 应变速率0.01-1 s<sup>-1</sup>的条件下, 流变应力开始随应变增加而增大, 达到峰值后趋于平稳, 表现出动态回复特征; 而在其他条件下, 应力达到峰值后随应变的增加而逐渐下降, 表现出动态再结晶特征。应变速率和流变应力之间满足指数关系, 温度和流变应力之间满足Arrhenius关系, 通过线性回归分析计算出该材料的应变硬化指数 $n$ 以及变形激活能 $Q$ , 获得该铝合金高温条件下的流变应力本构方程。

**关键词:** Al-Mg-Sc合金; 热压缩变形; 流变应力; 本构方程

### Flow stress behavior of Al-Mg-Sc alloy during hot compression

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**Abstract:** The flow stress behavior of the Al-Mg-Sc alloy during hot compression deformation conditions was studied by isothermal hot compression with thermal simulation test at deformation temperature range of 300-450 °C and strain rate range of 0.001-1 s<sup>-1</sup>. The experimental results indicate that the flow stress of Al-Mg-Sc alloy increases with increasing strain and tends to be constant after a peak value at 300 °C and strain rates range of 0.01-1 s<sup>-1</sup>, showing dynamic recovery. The flow stress falls down after a peak value with the increase of strain in other conditions, showing dynamic recrystallization. A hyperbolic sine relationship is found to correlate well the flow stress with the strain rate, and an Arrhenius relationship with the temperature. The strain hardening coefficient  $n$  and deformation activation energy  $Q$  are evaluated by linear regression analysis. And the flow stress constitutive equation of the alloy during hot compression is obtained.

**Key words:** Al-Mg-Sc alloy; hot compression; flow stress; constitutive equation

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