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## Mg-Nd-Zn-Zr 稀土镁合金的热变形行为

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摘要: 采用GLEEBLE-1500热模拟机对Mg-Nd-Zn-Zr稀土镁合金在温度为250~450 °C、应变速率为0.002~0.100 s<sup>-1</sup>、最大变形程度为60%的条件下, 进行高温压缩模拟实验研究。分析了实验合金在高温变形时的流变应力和应变速率及变形温度之间的关系, 计算了变形激活能和应力指数, 并研究了在热压缩过程中组织的变化, 为确定该稀土镁合金的挤压温度提供了实验依据。结果表明: 合金的峰值流变应力随应变速率的增大而增加, 随温度的升高而降低; 合金的变形激活能在300~400 °C内变化不大, 而在400~450 °C时增加很大; 根据实验分析认为该稀土镁合金挤压温度定在350~400 °C左右为宜; 在350 °C左右顺利挤出的实验合金有很好的力学性能:  $\sigma_b=275.5$  MPa,  $\delta=13.5\%$ 。

关键词: 稀土镁合金; 热模拟变形; 流变应力; 变形激活能; 力学性能

## Hot-compression deformation behavior of Mg-Nd-Zn-Zr magnesium alloy

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**Abstract:** The stress-strain behavior of a Mg-2.5%Nd-0.5%Zn-0.4%Zr (mass fraction, %) alloy at various strain rates and different deformation temperatures were investigated under maximum strain of 60%. The microstructure of the experimental alloy was studied in the hot-compression procedure. The results show that the relation between stress and strain is affected obviously by the strain rate and deformation temperature. The peak flow stress becomes larger with the increasing strain rate at the same temperature, and gets smaller with the increasing deformation temperature at the same strain rate. The deformation activation energy increases greatly in the range of 400-450 °C, and no more change in the range of 300-400 °C. The alloy can be extruded successfully at 350 °C with  $\sigma_b$  of 275.5 MPa and  $\delta$  of 13.5%. The mechanical properties of as-extrusion have a remarkable increase compared with those of the as-cast at room temperature.

**Key words:** Mg-Nd-Zn-Zr magnesium alloy; hot-compression; peak flow stress; deformation activation energy; mechanical properties

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