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AZ91D镁合金的热压缩变形行为

张晓华, 姜巨福, 罗守靖

(哈尔滨工业大学 材料科学与工程学院, 哈尔滨 150001)

摘要: 在应变速率为 $0.005\sim 1\text{ s}^{-1}$ 、温度 $250\sim 350\text{ }^{\circ}\text{C}$ 条件下, 采用Instron-5500热模拟机对AZ91D镁合金的高温压缩特性进行研究, 得到其真实应力—应变曲线。分析挤压温度和应变速率等对曲线的影响, 得出本构方程的一系列常数, 建立AZ91D镁合金在高温压缩中的本构方程关系式。结果表明: 变形过程中AZ91D镁合金的流动应力随温度的升高而降低, 随应变速率的升高而升高; 该流动应力可以用双曲正弦函数来描述, 其双曲正弦值随Zener-Hollomon参数自然对数的升高呈线性增大; AZ91D镁合金是正应变速率敏感材料, 其应变速率敏感指数 $m=0.14$ 。

关键字: AZ91D镁合金; 高温压缩; 流变应力; Zener-Hollomon参数

Compression deformation behavior of AZ91D magnesium alloy at elevated temperature

ZHANG Xiao-hua, JIANG Ju-fu, LUO Shou-jing

(School of Materials Science and Engineering, Harbin Institute of Technology, Harbin 150001, China)

Abstract: The compression tests of AZ91D magnesium alloy at elevated temperature were carried out on Instron-5500 at strain rates ranging from 0.005 to 1 s^{-1} and deformation temperature between 250 and $350\text{ }^{\circ}\text{C}$. The true stress—strain curves were obtained and the influences of deformation temperature and strain rate on the curves were analyzed. The constitutive equation and some constants of AZ91D magnesium alloy during compression deformation were gained. The results show that during the compression, the flow stress of AZ91D magnesium alloy decreases with increasing deformation temperature whereas it increase with increasing strain rates. The flow stress of AZ91D magnesium alloy at elevated temperature can be described with the hyperbolic sine function, and the hyperbolic sine value of flow stress will increase linearly with increasing natural logarithm of Zener-Hollomon parameter. The strain rate sensitivity index (m) of AZ91D magnesium alloy is equal to 0.14 .

Key words: AZ91D magnesium alloy; elevated temperature compression; flow stress; Zener-Hollomon parameter

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地 址：湖南省长沙市岳麓山中南大学内 邮编： 410083

电 话： 0731-88876765, 88877197, 88830410 传真： 0731-88877197

电子邮箱： f-ysxb@mail.csu.edu.cn