

论文摘要

中国有色金属学报

ZHONGGUO YOUSEJINSHUXUEBAO XUEBAO

第19卷 第10期 (总第127期) 2009年10月

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文章编号: 1004-0609(2009)10-1726-07

单轴应力循环作用下AZ91D镁合金的棘轮行为

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摘 要: 对AZ91D镁合金进行了室温单轴应力控制下的循环实验, 研究幅值应力 σ_p 、平均应力 σ_m 及峰值应力 σ_a 、应力比及加载历史对AZ91D镁合金棘轮行为的影响。结果表明: 棘轮应变率随 σ_a 和 σ_m 的提高而增大; σ_p 和应力比对棘轮行为产生很大的影响; 先前高平均应力、幅值应力水平的循环历史很大程度上抑制后续低应力水平时的棘轮行为; 先前低应力水平对后续的棘轮行为也会产生影响; AZ91D镁合金的 ε_r 与 σ_p 并不一一对应, 给出了 ε_r 与 σ_m 和 σ_a 的关系式。

关键字: AZ91D镁合金; 棘轮行为; 应力控制; 单轴加载; 本构模型

Ratcheting behavior of AZ91D magnesium alloy under uniaxial cyclic stressing

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Abstract: A number of uniaxial stress-controlled cycle loading experiments were conducted for AZ91D magnesium alloy at room temperature. The effects of the stress amplitude, mean stress, peak stress, stress ratio and loading history on the ratcheting behavior of AZ91D magnesium alloy were investigated. The results show that the ratcheting strain rate increases with increasing peak stress and mean stress. A prior cycling with higher mean stress or stress amplitude greatly decreases the ratcheting rate of the subsequent cycling with lower mean stress or stress amplitude. And prior cycling with lower stress has effect on the ratcheting behavior of the subsequent cycling with higher stress level. The correspondence between ε_r and σ_p is not one-to-one, the relationships among ε_r , σ_m and σ_a were obtained.

Key words: AZ91D magnesium alloy; ratcheting behavior; stress control; uniaxial loading; constitutive model

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