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论文

T型通道挤压变形Mg-1.5Mn-0.3Ce合金的超塑性和组织演变

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摘要：

采用T型通道挤压(TCP)对Mg-1.5Mn-0.3Ce合金(质量分数, %)进行了4道次热挤压变形, 其平均晶粒尺寸由原始轧制态的35 μm细化至2 μm; TEM观察表明, 经TCP变形后细小的第二相粒子$Mg_{12}Ce$弥散分布于晶内及晶界处. 变形合金在573-673 K及 1×10^{-1}-4×10^{-4} s^{-1}应变速率范围内显示良好的超塑性变形; 在温度为673 K及3×10^{-3} s^{-1}条件下, 得到最大的断裂延伸率为604%, 应变速率敏感系数m为0.36. 超塑性变形后断裂区域显微组织观察表明, Mg-1.5Mn-0.3Ce合金超塑性变形的主要机制为晶界滑移, 在较高温度、较低应变速率条件下超塑性变形时出现晶内滑移现象, 作为超塑性变形的协调机制促进晶界滑移, 随应变速率的降低或温度的升高晶内滑移越明显.

关键词： Mg-1.5Mn-0.3Ce合金zz')" href="#"> Mg-1.5Mn-0.3Ce合金 T型通道挤压 细化晶粒 高应变速率 超塑性 晶界滑移

SUPERPLASTICITY AND MICROSTRUCTURE EVOLUTION IN Mg-1.5Mn-0.3Ce ALLOY DEFORMED BY T-SHAPE CHANNEL PRESSING

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Abstract:

Mg--1.5Mn--0.3Ce alloy was deformed by T-shape channel pressing (TCP) for four passes at 623 K, and the grain size is greatly refined from 35 μm to 2 μm, and a number of tiny $Mg_{12}Ce$ dispersively distributes in intragranular and intergranular regions. Superplastic deformation behavior of TCP deformed alloy was investigated at temperatures ranging from 573 K to 673 K and strain rates ranging from 1×10^{-1} s^{-1} to 4×10^{-4} s^{-1}, and the microstructure evolution after tensile-to-failure was also analyzed. The experimental results indicated that the alloy deformed by TCP exhibits excellent superplasticity even in the condition of high strain rate at temperatures from 623 K to 673 K. The maximum elongation of 604 % is obtained at 673 K and a strain rate of 3×10^{-3} s^{-1}, and its strain rate sensitivity *m* is 0.36. Grain boundary sliding is the primary mechanism of the superplastic deformation, and intragranular slip would become more obvious at lower strain rate and higher temperature, and plays an accommodated role in promoting grain boundary sliding during the deformation.

Keywords: Mg-1.5Mn-0.3Ce alloy T-shape channel pressing grain refinement high strain rate superplasticity grain boundary sliding

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