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Al-Cu-Mg-Ag合金热压缩变形的流变应力行为和显微组织

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摘 要： 采用热模拟实验对Al-Cu-Mg-Ag耐热铝合金进行热压缩实验，研究合金在热压缩变形中的流变应力行为和变形组织。结果表明：Al-Cu-Mg-Ag耐热铝合金在热压缩变形中的流变应力随着温度的升高而减小，随着应变速率的增大而增大；该合金的热压缩变形流变应力行为可用双曲正弦形式的本构方程来描述，其变形激活能为196.27 kJ/mol；在变形温度较高或应变速率较低的合金中发生部分再结晶，并且在合金组织中存在大量的位错和亚晶；随着温度的升高和应变速率的降低，合金中拉长的晶粒发生粗化，亚晶尺寸增大，位错密度减小，合金的主要软化机制逐步由动态回复转变为动态再结晶。

关键字： Al-Cu-Mg-Ag合金；耐热铝合金；热压缩变形；流变应力

Flow stress behavior and microstructure of Al-Cu-Mg-Ag alloy during hot compression deformation

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Abstract: The behavior of the flow stress and the deformation microstructure of heat-resistant aluminum alloy Al-Cu-Mg-Ag during hot compression deformation were studied by thermal simulation test. The results show that the flow stress decreases with increasing deforming temperature and increases with increasing strain rate. The flow stress of the alloy during hot compression deformation can be described by constitutive equation in hyperbolic sine function with a hot deformation activation energy of 196.27 kJ/mol. Partial recystallization takes place in the alloys deformed at a high temperature or at a low strain rate, and large number of dislocations and subgrains are observed in the alloy. The elongated grains observed in the samples coarsen with increasing temperature and decreasing strain rate. Correspondingly, the subgrain size increases and

the dislocation density decreases. The main soften mechanism of the alloy transforms from dynamic recovery to dynamic recrystallization.

Key words: Al-Cu-Mg-Ag alloy; heat-resistant aluminum alloy; hot compression deformation; flow stress

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