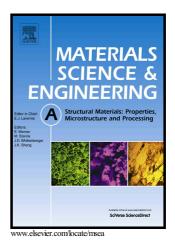
Author's Accepted Manuscript

Effect of strain rate and temperature on dynamic mechanical behavior and microstructure evolution of ultra-high strength aluminum alloy

Weiliang Zhang, Xinfeng Chen, Bochen Zhuo, Peijie Li, Liangju He



PII:S0921-5093(18)30802-5DOI:https://doi.org/10.1016/j.msea.2018.06.018Reference:MSA36573

To appear in: Materials Science & Engineering A

Received date: 21 November 2017 Revised date: 3 June 2018 Accepted date: 4 June 2018

Cite this article as: Weiliang Zhang, Xinfeng Chen, Bochen Zhuo, Peijie Li and Liangju He, Effect of strain rate and temperature on dynamic mechanical behavior and microstructure evolution of ultra-high strength aluminum alloy, *Materials Science & Engineering A*, https://doi.org/10.1016/j.msea.2018.06.018

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Effect of strain rate and temperature on dynamic mechanical behavior and

microstructure evolution of ultra-high strength aluminum alloy

Weiliang Zhang^{a,b,*}, Xinfeng Chen^c, Bochen Zhuo^{a,b}, Peijie Li^{a,b}, Liangju He^d

^aDepartment of Mechanical Engineering, Tsinghua University, Beijing 100084, China ^bState Key Laboratory of Tribology, Tsinghua University, Beijing 100084, China ^cSchool of Materials Science and Engineering, Tsinghua University, Beijing 100084, China ^dSchool of Aerospace Engineering, Tsinghua University, Beijing 100084, China *Corresponding author. Tel: +86-10-62785906. zwl15@mails.tsinghua.edu.cn

Abstract

The dynamic mechanical response of Al-Zn-Mg-Cu alloy with a high content of Zinc was studied using split Hopkinson pressure bar (SHPB) at strain rate of 1778 s⁻¹-6516 s⁻¹ and temperature of 25 to 400 °C. The microstructure evolution and fracture characteristics of this alloy were revealed from these studies. The obtained results show that the strain rate sensitivity is slightly positive below 3136 s⁻¹, but becomes negative at higher strain rates because of the development of adiabatic shear bands and cracks. From 25 to 400 °C, the flow stress decreases and there is an obvious decline above 200 °C due to occurrence of athermal softening. The dislocation microbands and geometrically necessary dislocation contribute to grain fragmentation. The fracture develops due to a combination of ductile and shear failure. This study in general provides a significant understanding on the relationship between microstructure evolution and mechanical behavior of high strength aluminum alloy under dynamic loading.

Keywords

Al-Zn-Mg-Cu alloy; high strain rates; thermal softening; microstructure evolution.

1. Introduction

Al-Zn-Mg-Cu (AA7xxx) alloys are widely used in aerospace applications and combat vehicles due to their excellent combination of properties such as high specific strength, good toughness and energy absorption capability [1, 2]. However, the alloys are subjected to

Download English Version:

https://daneshyari.com/en/article/7971812

Download Persian Version:

https://daneshyari.com/article/7971812

Daneshyari.com