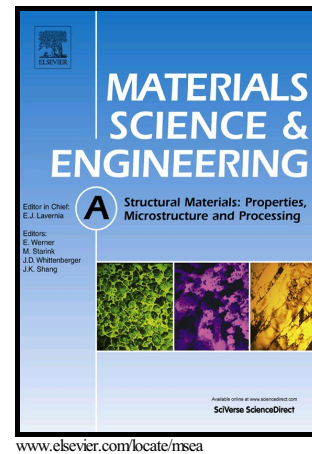


Author's Accepted Manuscript

On the Creep Behavior of Dual-Scale Particle Strengthened Nickel Based Alloy

Aniket K. Dutt, Somayeh Pasebani, Indrajit Charit, Rajiv S. Mishra



PII: S0921-5093(16)31065-6
DOI: <http://dx.doi.org/10.1016/j.msea.2016.09.008>
Reference: MSA34093

To appear in: *Materials Science & Engineering A*

Received date: 6 May 2016
Revised date: 4 August 2016
Accepted date: 1 September 2016

Cite this article as: Aniket K. Dutt, Somayeh Pasebani, Indrajit Charit and Rajiv S. Mishra, On the Creep Behavior of Dual-Scale Particle Strengthened Nickel Based Alloy, *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2016.09.008>

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.

On the Creep Behavior of Dual-Scale Particle Strengthened Nickel Based Alloy

Aniket K. Dutt¹, Somayeh Pasebani², Indrajit Charit², Rajiv S. Mishra^{1*}

¹Department of Materials Science & Engineering, University of North Texas, Denton, TX 76203, USA

²Department of Chemical and Materials Engineering, University of Idaho, Moscow, ID 83844-3024, USA

aniketdutt@my.unt.edu

spasebani@uidaho.edu

icharit@uidaho.edu

rajiv.mishra@unt.edu

*Corresponding author. Tel: +1 940-565-2316. Fax: 940-565-4824.

Abstract

A novel dual-scale particle strengthened Ni-20Cr based alloy was developed with addition of 1.2 wt.% nano-Y₂O₃ and 5 wt.% sub-micron Al₂O₃ via mechanical alloying. The Ni-20Cr-1.2Y₂O₃-5Al₂O₃ alloy exhibited significant reduction in the minimum creep rate (in the order of 10⁻⁹ s⁻¹) at 800 °C and 100 MPa.

Keywords

Oxide dispersion strengthened alloy; Creep; Transmission electron microscopy; Three-dimensional atom probe; Nano-indentation

1. Introduction

Development of high temperature structural materials is essential to fulfill the growing need for advanced coal-power plants, gas turbine inlets, and other high temperature applications. These materials should possess a combination of high creep resistance, stiffness and corrosion resistance in the highly pressurized oxygen- and hydrogen-rich environments. Nickel-based oxide dispersion strengthened (ODS) alloys are considered as promising candidate materials for such applications [1]. Dispersion strengthening has emerged as the most promising mechanism to provide high strength and stability at elevated temperatures [2]. This is in large part because of the attractive dislocation – particle interaction at high temperature via “departure side pinning” phenomenon, first reported by Nardone and Tien [3].

ODS alloys are typically processed via mechanical alloying of elemental or pre-alloyed powders in combination with nano-sized Y₂O₃ powder (or other rare earth oxides such as Ce₂O₃, La₂O₃) followed by hot extrusion or hot isostatic pressing (HIP) [4]. Homogeneous and uniform distributions of nano-sized and stable Y₂O₃ particles in the matrix of Ni-20Cr are potential

Download English Version:

<https://daneshyari.com/en/article/7974893>

Download Persian Version:

<https://daneshyari.com/article/7974893>

[Daneshyari.com](https://daneshyari.com)