

Study on Fatigue Failure of Alloyed Cu Bicrystals by means of in-situ SEM Observation

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1997 Fiscal Year Final Research Report Summary

Study on Fatigue Failure of Alloyed Cu Bicrystals by means of in-situ SEM Observation

Research Project

Project/Area Number

08455320

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

Structural/Functional materials

Research Institution

KANAZAWA UNIVERSITY

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Project Period (FY)

1996 – 1997

Keywords

fatigue crack / grain boundary structure / bicrystal / twin boundary / molecular dynamics / tilt boundary / grain boundary energy

Research Abstract

It has widely been accepted that a structure of grain boundary (GB) is one of the decisive factors affecting the GB-related phenomena such as the GB sliding, the GB corrosion and the GB stress-corrosion cracking, which are important for engineering purposes. In addition to these phenomena, fatigue behavior of materials is expected to be sensitive to the structure of the GB contained. In order to correlate the fatigue property with the GB structure, both fatigue experiments and simulations of the GB structures were carried out on the copper model bicrystals.

1. The results of the fatigue investigation on copper bicrystal having a longitudinal twist boundary are summarized as follows.

(1) The incompatibility of plastic strain at the GBs could induce high internal stresses in the vicinity of GBs, and apparently assists the nucleation of an intergranular fatigue crack.

(2) The GB affected zone was a strong barrier against the propagation of the intragranular crack that was initiated at a free ...▼ More

Research Products (16 results)

| | | All | Other |
|----------------|---|-----|---------------------------|
| | | All | Publications (16 results) |
| [Publications] | KITAGAWA Kazuo: "Effect of Plastic Strain Incompatibility on the Cracking of Twist Grain Boundaries in Copper Bicrystals" Proc.of 8th Japan Institute of Metals International Symposium (JIMIS-8). 507-510 (1996) | | ▼ |
| [Publications] | MONZEN Ryoichi: "Effect of Element Segregation on Nanometer Grain Boundary Sliding in Copper" Materials Science Forum. 207-209. 165-168 (1996) | | ▼ |
| [Publications] | VINOGRADOV Alexei: "Effect of Grain Boundary on Acoustic Emission During Plastic Deformation of Copper-Aluminum Bicrystals" Acta Metallurgica and Materialia. 44. 2883-2890 (1996) | | ▼ |
| [Publications] | 兼子 佳久: "Fe-30mass%Cr合金のΣ3(112)双晶粒界におけるき裂伝播とすべりの連続性との関係" 日本金属学会誌. 60. 345-346 (1996) | | ▼ |
| [Publications] | KITAGAWA Kazuo: "Plastic Deformation of Copper Single Crystals under Cyclic Loading" Materials Science and Engineering A. 234-236. 591-593 (1997) | | ▼ |
| [Publications] | KITAGAWA Kazuo: "Effect of Crystallographic Orientation and Grain Boundary on Acoustic Emission in Aluminum Single-and Bi-crystals" Materials Transactions, JIM. 38. 607-614 (1997) | | ▼ |
| [Publications] | VINOGRADOV Alexei: "Effect of Triple Junction on Fatigue Crack Growth in Copper and Copper-3at.% Aluminum Tricrystals" Scripta Materialia. 36. 417-423 (1997) | | ▼ |
| [Publications] | HASHIMOTO Satoshi: "Grain Boundary Cracking in Fatigued Bicrystals" Interface Science. 4. 347-355 (1997) | | ▼ |
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| [Publications] | Y.Kaneko: "Relationship between Crack Propagation and Slip Continuity at the SIGMA3 (112) Twin Boundary in Fe-30 mass% Cr Alloy" J.Japan Inst.Metals. 60. 345 (1996) | | ▼ |
| [Publications] | K.Kitagawa: "Plastic Deformation of Copper Single Crystals under Cyclic Loading" Materials Science and Engineering A. 591. 234-236 (1997) | | ▼ |
| [Publications] | K.Kitagawa: "Effect of Crystallographic Orientation and Grain Boundary on Acoustic Emission in Aluminum Single-and Bi-crystals" Materials Transactions, JIM. 38. 607 (1997) | | ▼ |
| [Publications] | A.Vinogradov: "Effect of Triple Junction on Fatigue Crack Growth in Copper and Copper-3at.% Aluminum Tricrystals" Scripta Materialia. 36. 417 (1997) | | ▼ |
| [Publications] | S.Hashimoto: "Grain Boundary Cracking in Fatigued Bicrystals" Interface Science. 4. 347 (1997) | | ▼ |

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