

High-Strength Nanocrystalline Nickel-Tungsten Alloys Produced by Electrodeposition?



1 Introduction Nanocrystalline metallic materials are generally limited in practical applications because of their severe brittleness. It has not yet been well understood whether their brittle behavior is due to an intrinsic feature of nanocrystalline materials, or whether this is due to processing difficulties for the fine grain sizes such as an imperfect consolidation of the nanocrystalline powders [1]. On the other hand, electrodeposition is a superior technique for producing nanocrystalline materials having grain sizes anywhere from the essentially amorphous to nanoscaled materials for the grain sizes of about 5 to 50 nm in bulk form or as coatings with no post-processing requirements. However, most of the electrodeposited alloys have also exhibited severe brittleness [2,3]. In a previous study, we developed an aqueous plating bath for producing amorphous and nanocrystalline Ni-W alloys having high hardness and good ductility [4-6]. The purpose of this presentation is to show that the nanocrystalline Ni-W alloys having high tensile strength of about 2300 MPa with good ductility can be produced by electrodeposition. As a matter of fact, sheets can be bent through an angle of 180 degree without breaking. In addition, embrittlement behavior of the Ni-W electrodeposits during annealing has been studied, and a mechanism for the brittleness in nanocrystalline materials has been discussed.

Bewertung: Noch nicht bewertet

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