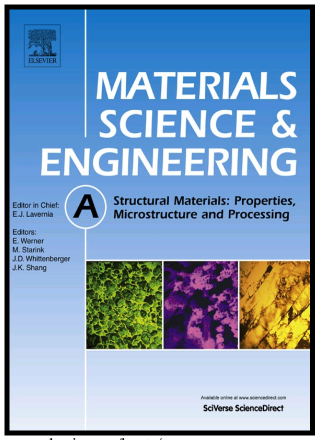

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Contribution of grain boundary related strain accommodation to deformation of UFG Pd

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Abstract

Ultrafine-grained Pd specimens with a mean grain size of 130 nm were compressed by 10% in a scanning electron microscope and the strain-induced change in orientations of grains was measured by *in-situ* electron-backscattering diffraction. A comparison of grain orientations before and after compression straining revealed substantial grain rotations. The analysis of the results performed using polycrystal plasticity simulation showed that the variation of orientations with strain cannot be explained only by crystallographic dislocation slip. A large portion of strain is proved to be accommodated via cooperative non-crystallographic grain rotation.

Key words: nanostructured materials; EBSD; plasticity; grain boundaries; deformation mechanisms

1. Introduction

The deformation mechanisms operating in nanostructured materials in the specific range of grain sizes of ~ten to hundreds of nanometers have not yet been identified comprehensively. In particular, the role of non-crystallographic deformation modes such as grain boundary sliding (GBS) and rotation for the grain size range ~100 nm is still a matter of discussion. In general, it is assumed that such strain accommodation is considerable at grain sizes in the range of a few tens of nanometers while for the larger grains dislocation-based mechanisms operate. Recent studies of nanocrystalline Pd-Au [1] show that grain boundary sliding can be the main deformation mechanism at grain sizes below 26 nm, and above it, the contribution of GBS decreases. However, at present a large number