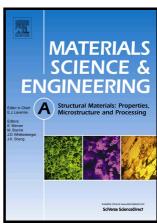
## Author's Accepted Manuscript

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Influence of Equal Channel Angular Pressing on High Cycle Fatigue Behavior of Ultrafine-Grained Iron:

Role of Anisotropy

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**Abstract** 

The high cycle fatigue behavior of ARMCO® Iron processed by equal-channel angular pressing (ECAP) was

USCHIP

investigated for routes A and Bc, which results in ultrafine-grained microstructures with high and low grain

elongations, respectively. Rotating bending fatigue tests along two different testing directions show a

significant anisotropy in the fatigue strength for route B<sub>c</sub> but only marginal differences for route A, in spite

of the higher grain elongation and stronger crystallographic texture that is generated by route A. Still, the

fatigue damage at the surface of samples processed by route A is highly anisotropic, as it is confined to

regions with a certain alignment of the microstructural elongation plane with regard to the surface plane.

The anisotropy in high cycle fatigue strength for route B<sub>C</sub> as well as the surface orientation dependent

resistance to fatigue damage for route A are discussed with regard to the alignment of the shear plane

during the last ECAP pass and the correlation between the microstructural morphology and subgrain

coarsening that lead to fatigue crack initiation.

Keywords: fatigue; severe plastic deformation (SPD); ultrafine grained

microstructures; anisotropy; iron alloys; electron microscopy

1. Introduction

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