Deformation and fracture characteristics of ultrafine-grained vanadium

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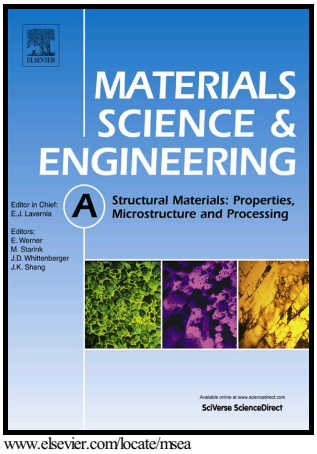

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Deformation and fracture characteristics of ultrafine-grained vanadium

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Abstract

Commercially pure vanadium was processed by high pressure torsion at room temperature into the saturation regime and investigated with respect to the microstructure and resulting mechanical properties. Besides hardness, strength and ductility special emphasis was put towards the fracture toughness after processing. The results demonstrate, so far unusual for pure ultrafine-grained basic-cubic centered metals, remarkable ductility and fracture toughness while also having high strength.

Keywords: high-pressure torsion; severe plastic deformation (SPD); vanadium; fracture toughness; body centered cubic (bcc)

1. Introduction

Strengthening through severe plastic deformation (SPD) is a promising way to improve mechanical and physical properties of pure metals or alloys and could open new application areas, where to date other strengthening mechanisms, e.g. alloying, were required to obtain satisfying mechanical