Meetings International SciTechnol

Suchecki P et al, J Clin Exp Oncol 2018, Volume:7
DOI: 10.4172/2324-9110-C5-021

International Conference on ONCOLOGY AND RADIOLOGY
&
International Conference on NANOTECHNOLOGY

December 03-04, 2018 | Edinburgh, Scotland

Mechanisms of recrystallization and grain growth in a nanostructured austenitic stainless steel annealed under high hydrostatic pressure

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The aim of this study was to investigate the mechanisms of recrystallization and grain growth in a nanostructured austenitic stainless steel 316LVM annealed under high hydrostatic pressure. The nanostructures were obtained by profile rolling (PR) to a total strain of 3.4, and by high-pressure torsion (HPT) to a total strain of 79. These processes resulted in microstructures consisting of nanotwins and nanograins, respectively [1, 2]. The deformed samples were annealed at 900°C for 10 min under atmospheric or hydrostatic pressure of 6 GPa (Fig.1). After 10 min of annealing, the HPT-processed samples showed smaller grain size than the PR-processed samples. This was attributed to the more uniform microstructure of a HPT samples and their higher content of non-equilibrium grain boundaries, which have the tendency to a rapid recovery during heating drastically reducing the driving force for grain growth. Annealing under high hydrostatic pressures of 6 GPa retarded the processes of recrystallization and grain growth in samples processed by both methods; however, the retardation is much more pronounced for a PR-processed samples. Moreover, samples annealed under high pressure showed different textures in comparison to samples annealed under the atmospheric pressure. In the case of PR-processed sample annealed under the high hydrostatic pressure appeared local maxima on <111> fiber close to {111}<-1-12>. In the case of HPT-processed sample, high pressure annealing promoted the appearance of <100> fiber.

Biography

Przemyslaw Suchecki is a researcher at Warsaw University of Technology, Faculty of Materials Science and Engineering. He has published 4 papers in reputable journals. He is working with nanostructured austenitic stainless steel. During his PhD studies he was working with geopolymers.

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