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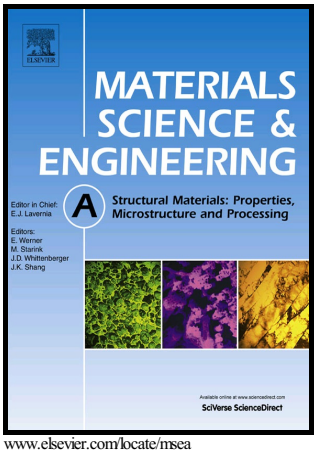

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On the strength-hardness relationships in a Zr-Nb alloy plate with bimodal basal texture microstructure

Huilong Yang[1*], Sho Kano[1], Jingjie Shen[2], John McGrady[1], Zishou Zhao[1], Zhengang Duan[3], Hiroaki Abe[1]

[1]Nuclear Professional School, School of Engineering, The University of Tokyo, 2-22 Shirakata Shirane, Tokai, Ibaraki 319-1188, Japan

[2]National Institute for Fusion Science, 322-6 Oroshi, Toki, Gifu 509-5292, Japan

[3]Graduate School of Engineering, Tohoku University, 2-1-1 Katahira, Sendai 980-8577, Japan

[*]Corresponding author. Tel.: +81-29-287-8992. yanghuilong@tokai.t.u-tokyo.ac.jp

Abstract

In this study, the mechanical properties in a Zr-Nb alloy plate with bimodal basal texture microstructure have been evaluated by tensile, Vickers hardness and nano-indentation tests. Based on the results, the strength-hardness relationship is discussed with special attention paid to its textured microstructure. It is found that the correlation between strength and hardness varied greatly depending on whether the loading direction is parallel or perpendicular to the normal direction of the plate, demonstrating that the strength-hardness relationship is texture-dependent. In addition, the relation between strength and nano-hardness is obtained by subjecting specimens to cold rolling at various reduction rates. This allows for the evaluation of the strengthening effect using convenient and non-destructive nano-indentation tests instead of elaborate tensile tests, which may have particularly useful applications for nuclear engineering components when considering the irradiation strengthening occurred in these materials.

Keywords: Zr alloy; texture; strength; Vickers hardness; nano-indentation