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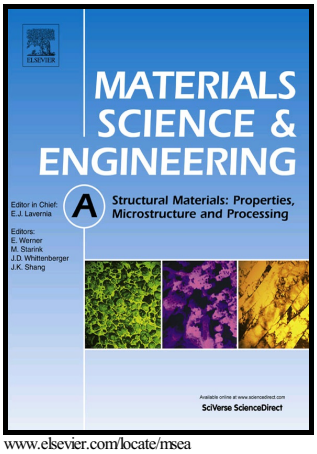

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Grain refinement and tensile properties of a metastable TiZrAl alloy fabricated by stress-induced martensite and its reverse transformation

X.J. Jiang[a,b], H.T. Zhao[a],R.H. Han[a], X.Y. Zhang[b], M.Z. Ma[b], R.P. Liu[b*]

[a]Hebei Provincial Key Laboratory of Traffic Engineering materials, School of materials science and Engineering, Shijiazhuang Tiedao University, Shijiazhuang 050043, China

[b]State Key Laboratory of Metastable Materials Science and Technology, Yanshan University, Qinhuangdao 066004, China

[*]Corresponding author. *State Key Laboratory of Metastable Materials Science and Technology, Yanshan University, Qinhuangdao 066004, China. (*R.P. Liu).

Abstract:

Multi-loop composite processes of deforming with low strain and annealing are proposed to investigate grain refinement and tensile properties of a metastable $TiZr_{40}Al_{15}$ alloy fabricated by stress-induced martensite transformation (SIMT) and its reverse transformation. The average grain size obviously decreases from 550μm to 0.5μm with increasing the number of loops from 0 to 3. In addition, the mechanisms of deformation and refinement are discussed systematically. As strain increases, dislocation slip and twinning become the main deformation mechanisms instead of SIMT, and the deformation is more uniform in the smaller original grain, which will lead to more intensive and uniform nucleation points of β-recrystallization, and accordingly, the grain refining effect will be more significant. Moreover, the trigger stress and the tensile strength possess relatively good linear relationship with $d^{-1/2}$. The ultrahigh strength of 1426MPa and the good elongation of 13% are obtained after 3 loops composite processes.

Keywords: Titanium alloy; Stress-induced martensite transformation; Grain refinement; Mechanical properties