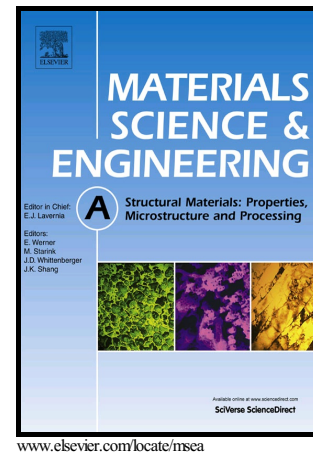


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Influence of strongly textured microstructure on the all-round shape memory effect of rapidly solidified Ni₅₁Ti₄₉ alloy

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Abstract

Ni₅₁Ti₄₉ alloy strip with all-round shape memory effect (ARSME) was obtained through rapid solidification followed by constraint-aging treatment. The high cooling rate and large temperature gradient along the thickness direction of Ni₅₁Ti₄₉ alloy strip yield fine columnar grains and strong fiber texture of $\langle 100 \rangle_{B2}$ during rapid solidification. Such fine-grained and strongly textured microstructure increases the nucleation, limits the orientation and restricts the growth of Ni₄Ti₃ precipitates during constraint-aging treatment. The fine and well-aligned Ni₄Ti₃ precipitates with dispersive distribution introduce strong coherent stress field and numerous interfaces between the matrix and precipitates in the rapidly solidified and constraint-aged Ni₅₁Ti₄₉ alloy. Homogeneous composition and massive interfaces in the B2 matrix promote the simultaneity of local phase transformations. The strong coherent stress field and the excellent deformability of $\langle 100 \rangle_{B2}$ -oriented grains contribute to large deformation and high recovery ratio of the alloy during phase transformation. Thus, the strongly textured microstructure formed during rapid solidification allows the constraint-aged NiTi alloy to possess superior ARSME with narrow phase transformation temperature range.

Keywords: NiTi alloy; texture; rapid solidification; all-round shape memory effect; Ni₄Ti₃ precipitate

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