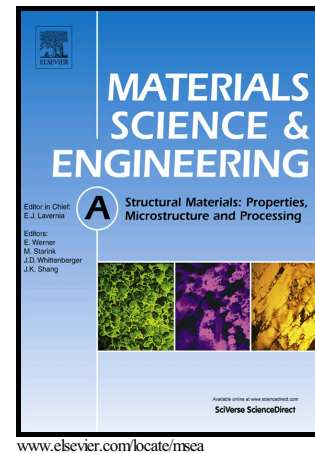


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Solid solution effects on hardness and strain rate sensitivity of nanocrystalline NiFe alloy

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Abstract

Solid solution effects on the hardness and strain rate sensitivity of nanocrystalline (NC) alloys were studied using electro-deposited Ni and NiFe thin films. Nanoindentation testing showed enlarged hardness with increasing Fe content, and grain size reduction was proposed to be the main mechanism underlying such strengthening. Strain rate sensitivity was found to be effectively reduced as Fe content was increased. Compared with pure NC Ni, this behavior was not expected as NC NiFe alloy possesses much smaller grain size, thus should exhibit higher strain rate sensitivity. As a consequence of grain boundary pinning via Fe solute, the changeover in dominant deformation mechanism from intergranular to intragranular plasticity was proposed to interpret the unexpected decrease in strain rate sensitivity with increasing Fe content.

Keywords: Solid solution ; Hardness ; Strain rate sensitivity ; Nanocrystalline alloy ; Nanoindentation

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