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Size dependent alloying and plastic deformation behaviors of Ti/Ni nano-multilayers

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Abstract: Proper modulation ratio (η) and modulation period is very critical for alloying of metallic multilayers. In this work, size dependent alloying and plastic deformation behaviors of Ti/Ni nano-multilayers have been investigated by nanoindentation. It is found that the multilayers deposited at 450 ºC and annealed at 600 ºC have fully alloyed. Phase compositions of the alloyed multilayers strongly depend on η and massive B2-NiTi phases spring up at η = 1.7. Nanoindentation hardness of the alloyed multilayers reaches the maximum at η = 1.7 and also shows modulation ratio dependence, which mainly results from conversion of phase compositions with changing η. Indentation depth dependent hardness agrees well with the model of geometrically necessary dislocations.

Keywords: Ti/Ni multilayer; Modulation ratio; Nanoindentation; Alloying; Mechanical properties

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