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# The effect of Nb solute and NbC precipitates on dynamic and metadynamic recrystallisation in Ni-30Fe-Nb-C model alloys

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## Abstract

Dynamic and metadynamic recrystallisation behaviour of Ni-30Fe-Nb-C model alloys during plane strain compression was investigated by optical and electron microscopy. The dynamically recrystallised grains were primarily located at the pre-existing grain boundaries with few additional new recrystallised grains in the prior grain interior. A limited nucleation of recrystallised grains at >400 nm size NbC particles was also evident. On the other hand, smaller semi-coherent particles (~10-150 nm) severely inhibit the dislocations rearrangement and subgrain boundary mobility, thus leading to sluggish or even suppressed dynamic and metadynamic recrystallisation. These smaller NbC particles maintained cube-on-cube orientation relationship with austenite matrix  $(001)_{\text{NbC}} \parallel (001)_{\gamma}$ ,  $[001]_{\text{NbC}} \parallel [001]_{\gamma}$ . The shape of the NbC particles changes from nearly ellipsoidal to octahedral followed by hexagonal and tetra-kai-decahedral by truncation of  $\{111\}$  facets by  $\{001\}$  ones.

**Keywords:** Dynamic recrystallisation, Metadynamic recrystallisation, Particle stimulated nucleation, Precipitation, Model alloy, Plane strain compression.

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