

Lattice matched NiSi₂ tetrahedrons in Si whiskers

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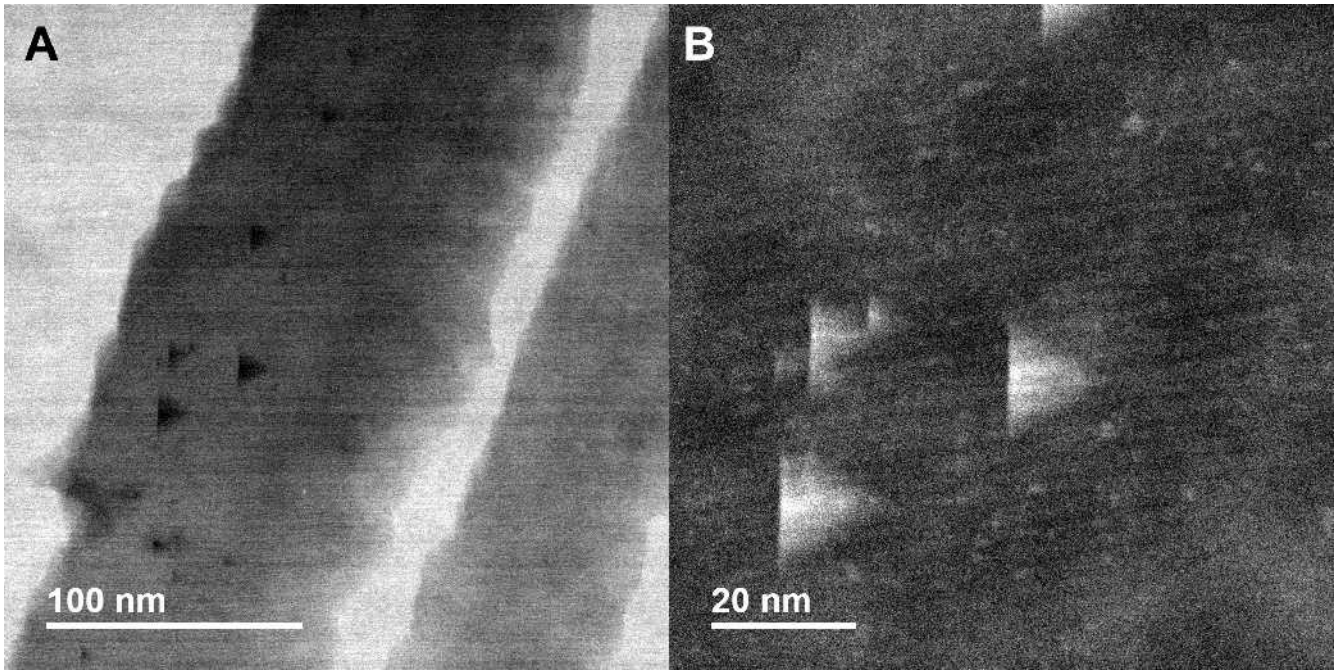
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Tetrahedral inclusions were found by transmission electron microscopy in Si whiskers obtained during Ni induced lateral crystallization of amorphous silicon at low temperature. The inclusions are coherently lattice matched to the Si matrix with sizes ranging from a few nm to about 20 nm. The interface of the inclusions are all {111} type planes perfectly flat in most cases, although, steps of several lattice plane height rarely occur. Considering the crystal structure and the Ni content confirmed by EELS we identified the NiSi₂ phase inside the inclusions. The whisker axis orientation is random in contrast to the usual <111> whisker growth direction, however, parallel whiskers often have the same orientation.

Considering the Ni amount in the inclusions, which exceeds the solubility limit of Ni in Si these inclusions could not form as precipitates, rather they were trapped inside the growing Si whisker at the moving Si/NiSi₂ interface. The morphology and interface structure of the inclusions are discussed in detail.



STEM BF (A) and STEM HAADF (B) images of NiSi₂ tetrahedrons in a Si whisker obtained by Ni induced crystallization