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Growth and chemical etching of InBi0.6Sb0.4 single crystal

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$InBi_{0.6}Sb_{0.4}$ single crystal has been grown by the zone melting method. The freezing interface temperature gradient of 30˚C/cm has been found to yield the best quality crystal obtain at growth velocity 1.0 cm/hr. Parallel striations perpendicular to the ingot axis was observed on the top free surfaces of crystal. A new dislocation etchant based on nitric acid has been found to give reproducible etch-pitting on the cleavage surface. Standard tests for a dislocation etchant have been carried out and results are reported. Zone melting is a well-known widely used technique to grow crystals of alloys and intermetallic compounds. However, in our laboratory, we have successfully used syringe-pulling method for the growth of low melting point alloys like InBi. However, detailed characterization of the crystals grown by this technique is in progress.

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EBSD studies on phase transformation of ferrite to nickel free high nitrogen austenite by solution nitriding

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Solution nitriding is one of the cost-effective process and a novel heat treatment for producing nickel free high nitrogen austenitic stainless steels. For the purpose of fabricating these advanced austenitic stainless steels, it is necessary to obtain fundamental information on the ferrite to austenite phase transformation mechanism. In this study, the phase transformation of ferrite to nickel free high nitrogen austenite by solution nitriding was investigated using optical microscopy, X-ray diffraction (XRD) and electron back scattering diffraction (EBSD). Solution nitriding was carried out on a ferritic Fe-22.7Cr-2.4Mo stainless steel plates at 1200°C for 1 and 3 h under nitrogen gas atmosphere of 0.25 MPa. The results showed that upon nitriding, the austenite phase with acicular morphology nucleated in the near surface areas and grew toward ferritic core. The depth of austenite layer was increased from 150 to 470 μm with increasing nitriding time from 1 to 3 h. The EBSD studies revealed that the austenite phase have Kurdjumove-Sachs (K-S) or Bain orientation relation with respect to the ferrite phase. The misorientation across ferrite/austenite phase boundary did not change by increasing the nitriding time. The austenite/austenite boundaries separated by high-angle grain boundaries with 50.9° misorientation and there is large amount of twins of the type Σ3 with 60° misorientation inside austenite grains.

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