Carnegie Mellon

Materials Science and Engineering Seminar Series

Materials Research at Carnegie Mellon

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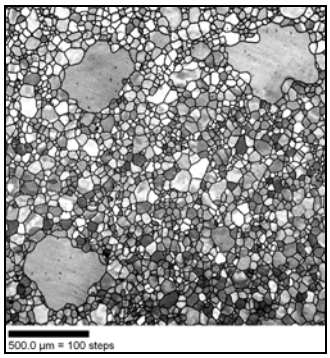
"Abnormal Grain Growth in Fe-1%Si"

Friday, April 7, 2006
11:00 A.M. Seminar in Baker Hall 136A
Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

The iron – silicon system has been studied extensively for several decades and is best known for its magnetic properties and use in transformers and motors. These alloys are interesting because of the frequent observations of the preferential (abnormal) growth of grains of specific orientations that enhance such magnetic properties. In this work, abnormal grain growth (AGG) was studied in an Fe-1%Si alloy using automated Electron Backscattered Diffraction (EBSD). Industrially processed samples temper rolled to 0%, 1.5% and 8% were annealed in air for various times followed by quenching in water. A few grains were observed to grow abnormally while the matrix remained essentially static and did not coarsen. The driving force for AGG in this material was determined to originate from the stored energy of deformation. This stored energy was evaluated by examining intragranular orientation gradients that showed drastic reductions for the abnormally large growing grains. The following figure shows an example of AGG in a sample of the Fe-1%Si alloy.

Fig. 1.0: Abnormal growth in a sample of Fe-1%Si alloy.



Tricia received her Bachelor degree in Mechanical Engineering from Florida State University in 2001. She received her MS in Materials Science and Engineering from Carnegie Mellon University in Dec. 2002. She is currently a graduate research assistant working towards her Ph.D. under the guidance of Profs. Anthony Rollett and Peter Kalu.