

Carnegie Mellon

Materials Science and Engineering Seminar Series

Materials Research at Carnegie Mellon

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“3-D Moment Invariants for the classification and characterization of the morphology of γ precipitates in Nickel-base superalloys”

Friday, February 8, 2008

11:30 A.M. Seminar in Baker Hall A51

Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

□ In nickel-base superalloys the predominant phases are the disordered matrix phase γ and the ordered phase γ' . The mechanical properties depend to a large extent on the distribution and morphology of these precipitates. These precipitates can have a wide variety of shapes, depending on heat treatment and processing conditions, ranging from simple near spherical or cuboidal shapes to complex near-dendritic shapes. A quantitative description of such shapes is necessary for comparisons between experimentally obtained microstructural data and with numerical results such as those produced by phase field simulations.

Moment invariants (combinations of second order shape moments that are invariant with respect to affine or similarity transformations) can be used as sensitive shape discriminators in 3-D. The application of moment invariants be illustrated by means of a serial sectioning data-set, obtained by focused ion beam milling, of a Rene 88-DT nickel-base superalloy, which contains near-dendritic γ' precipitates. The precipitate shapes will be analyzed by means of the second order moment invariants.

Jeremiah received his B.S. in Metallurgical and Materials Engineering from Colorado School of Mines in 2001. From 2001-04 he worked as Nuclear Engineer for Puget Sound Naval Shipyard in the Reactor Engineer Division of the Nuclear Engineering and Planning Department. He is currently a Ph.D. candidate under the guidance of Prof. De Graef.