

**Department of Materials Science and Engineering
Massachusetts Institute of Technology
3.14 Physical Metallurgy – Fall 2003**

Review Assignment #2

Due Monday, November 3, 2003

Three recent research articles have been made available on the course website:

1. T. Harry and D. J. Bacon, “Computer Simulation of the Core Structure of the $\langle 111 \rangle$ Screw Dislocation in α -Iron Containing Copper Precipitates: Dislocation-Precipitate Interaction and the Strengthening Effect”, *Acta Materialia*, Volume 50, Pages 209-222 (2002).

This article describes how screw dislocations interact with coherent precipitates in iron, using state-of-the-art simulation techniques to explore details inaccessible using continuum equations.

2. N. Stanford, D. Dunne, and M. Ferry, “Deformation and Annealing of (001)[01-1] Oriented Al Single Crystals”, *Acta Materialia*, Volume 51, Pages 665-676 (2003).

This article is an esthetically pleasing study of recrystallization in single crystals that have been deformed in multiple slip configuration. Modern experimental tools are used to get insight into the nucleation sites for recrystallization.

3. S. S. Sahay, C. P. Malhotra, and A. M. Kolkhede, “Accelerated Grain Growth Behavior During Cyclic Annealing”, *Acta Materialia*, Volume 51, Pages 339-346 (2003).

This article describes a study of grain growth in steel, but under conditions of cyclic temperature, as might be seen by parts in service. The authors report a significant and unexpected difference from grain growth as we normally understand it.

Your assignment is to select one of these three articles, read it carefully, and think critically about what you have read. You will then prepare a short review of the article, in about 3 pages. About the first third of your review should be a synopsis of the paper, inclusive of methods and main results. The remainder of the review should offer a critique of the paper, and present some creative thoughts for future questions to be addressed. For example, some things to discuss may include:

- Does anything in this paper contradict the “textbook” knowledge that you are learning in class?
- Are the methods used in the work sufficient to support the conclusions drawn by the authors?
- Is the logic internally consistent? Do all of the data support the same conclusion?
- Can you suggest a better way to resolve one or more of the open questions in this work?
- Is there a simple experiment that can either refute or substantially support the authors’ claims?
- How general are the conclusions of this paper; are these results to be expected for other metals or materials?

- What doors does this work open for future research?