

Essay 3: Aluminum Crystal Task

Math 300 Spring 2003 ¹

For this assignment you need the following documents.

1. The word document which begins Swing Batter Swing. I have labeled it, crystal task II, on the website. This take a very long time to download you may want to only download the version crystal task II. I will hand this one out in class.
2. The pdf file: Average Grain indicator. (Only the first page is relevant.)
3. This assignment sheet.
4. crystal task I: Text only version of crystal task II

The materials handed out in class and posted on the web (1 and 2 above) were originally designed as a project for Engineering students. The aim is to develop a notion of crystal size and devise a procedure for determining the size of crystals given in three micrographs (blown up photographs of a piece of metal). In groups, we will work through the solution of this problem in class on March 10.

Each of you will write an essay describing a solution to the engineers problem. That is, Determine an indicator of ‘crystal size’ and explain a procedure for finding the crystal size from a micrograph. Apply this procedure to three sample pictures that are given to you. Decide which of these samples represents the best choice of material for a baseball bat. (Assume all bats are the same price.)

Now, we move to the mathematician’s perspective. Although there may be many different procedures that different groups develop to solve this problem, I expect two essentially different indicators will be suggested. (I’ll make sure both come up in class. JTB) Your second task will be to describe the difference between these two indicators and explain what features (i.e. what kinds of shapes) of crystals will appear better under each of the two indicators. Your explanation should enable a materials engineer to decide (on the basis of her knowledge of how crystal shape as well as size affects strength) which indicator is more appropriate.

Thus the second part of your essay will contain a description of a procedure for determining a second indicator of crystal size. (Probably the second indicator will be the Average grain intercept, but perhaps that will be your first choice.) In the essay you should contrast the procedures for each indicator and the effect of the choice of indicator on various shapes of crystal.

¹Adapted from materials developed by the Small Group Mathematical Modeling (SGMM) Project, Purdue University. Copyright by Center for Twenty First Century Conceptual Tools (TCCT), Purdue University. Permission granted for classroom use and research purposes.