



EMS-162L: Structure and Characterization of Materials Laboratory

Winter Quarter, 2005

Crystallite Size Analysis

1. What is the difference between crystallite size and particle size?
2. The manufacturer's specifications on a nanocrystalline powder states that it has a specific surface area of $48 \text{ m}^2/\text{g}$ and a density of 5.1 g/cm^3 . Assume the particles are spherical and estimate the particle size (diameter).
3. Both the Scherrer and the Warren-Averbach methods measure column lengths for the crystallites. What is meant by the term column length and how does it relate to the size of a crystallite?
4. The essential results from diffraction pattern for an aluminum sample have been compiled in a file available on the course's web site at: www.matsci.ucdavis.edu/matscilt/ems-162l/files/csize2-aluminum.txt. Download this file and analyze it using the Williamson-Hall method described in your laboratory manual to determine the crystallite size and microstrain. Report the crystallite size as the diameter of a sphere.

The instrumental peak broadening for the instrument used in this work can be represented by equation 5 in the experiment's procedure. In this case equation 5 was used to represent the variation in integral breadth. Fitting this equation to the data from the line width standard yielded the following: $u = -1.288 \times 10^{-4}$ radians and $v = 1.743 \times 10^{-3}$ radians.