

IXS Single Crystal Basics

Alfred Baron, August, 2009

The following are some relevant points for measuring phonons in single crystals at BL35U. Note, especially, that *a sample prepared for neutron scattering, and especially for inelastic neutron scattering, is frequently of very poor quality for IXS measurements.*

0. Larger (up to a few mm) is almost always easier. We can and do measure 10 micron samples. But count rate is always an issue. 1mm samples are much easier. If larger than ~2mm, consider cutting a smaller piece, or talk to a local contact, to make sure the sample will fit in/on our holders.

1. Know the attenuation length. You should know the absorption length of your sample. This sets the scale for the size and possible interference of surface features. It also sets the length scale for a transmission (Laue geometry) measurement. For transmission measurements, the sample should be 1 to 2 absorption lengths thick along the x-ray beam – not more. If necessary, please use http://henke.lbl.gov/optical_constants/atten2.html.

2. Pre-aligned samples are required. Knowing the alignment of the sample (ie: two non-parallel reflections, or two axes of the unit cell, etc, *not* just one surface normal) at the level of a few (say ± 5) degrees is crucial. While we will refine the alignment on the spectrometer, to go searching for Bragg reflections from scratch is a waste of beam time.

3. The sample must be a SINGLE DOMAIN. Be sure your sample is a single crystal without, say, some tiny domains with a different orientation (as can easily appear in flux-grown crystals). The beam size is ~50 microns, and often does not illuminate the full sample, so if present, micro-domains can appear unexpectedly and lead to strange results. You are urged to put your sample on a 4-circle diffractometer and scan over ALL of symmetry allowed reciprocal space to insure no microdomains are present.

4. Mosaic. The mosaic requirements for IXS are relatively relaxed unless you need either very good Q resolution, or want to work very near a Bragg peak, etc. Typically, 0.1 degree mosaic is no problem. We begin to worry above 0.5 degrees.