

Supplement 3: Comparison of Digital Topographs with Film

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Abstract This supplement provides evidence that the CCD topographic images are similar to film.

1. Introduction

Topographs are normally collected with film or nuclear emulsions which have usable resolutions down to about 1 micron. Since a CCD with a pixel size of $8 \times 8 \mu\text{m}^2$ was used to collect the topographs it is important to verify that the images collected with the CCD contain the same information that would be collected with a conventional approach. Unfortunately, a comprehensive topographic imaging setup was not available during our synchrotron trip so we had to make due with the available material to approximate a typical setup. Ideally, we would have used a nuclear emulsion, as it provides the highest resolution; we were limited to Kodak X-OMAT AR film.

2. Experimental Setup

Two types of images were taken with the crystal going through a 0.020° oscillation. The first was with the CCD alone with a 6 s X-ray exposure (Figure 1a). The second was with the film in a holder positioned directly in front of the CCD using a 25 s exposure (Figure 1b).

3. Processing of Data

The CCD data shown in Figure 1c and 1d is the raw data collected from the detector. Kodak X-OMAT AR film was used to capture topographs. A custom film holder was constructed to hold film in front of the topography detector to capture the same topographs as seen by the MarCCD detector. To minimize the chance of overexposure or a bad sheet of film causing the experiment to fail, several sheets of film were exposed at once. On-site development facilities were not available so the film was developed off-site about 48 h after exposure using a Konica SRX-101A developer. The image was then digitized with a QImaging MicroPublisher RTV 3.3 camera coupled to a Nikon SMZ800 microscope with transmitted lighting yielding an effective pixel size of $3.8 \mu\text{m}$ by $3.8 \mu\text{m}$ (Figure 1e).

4. Results

The film and CCD appeared to capture similar data as shown in Figure 1c, 1d and 1e. The overall reflection shapes are conserved across all three images.

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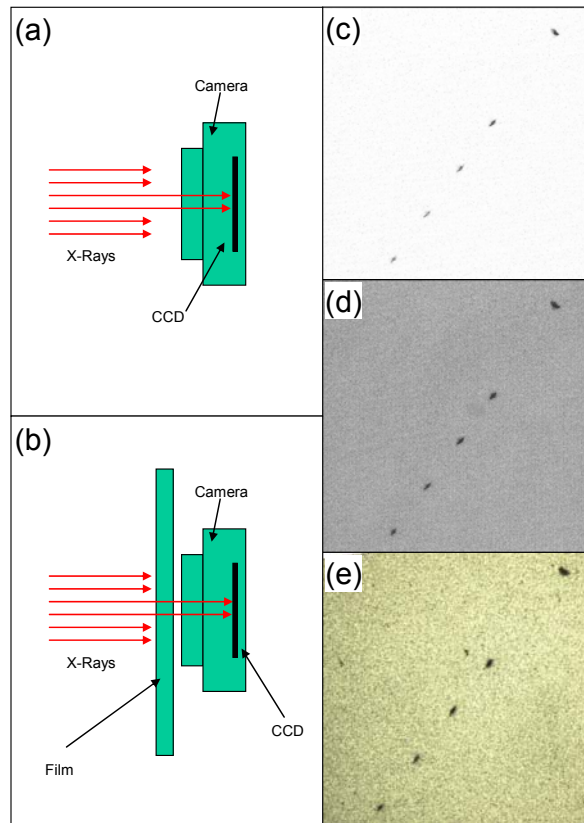


Figure 1 Experimental Setup and Results. (a) Short exposure without film; (b) Long exposure with film produces two images, one on the film and one on the CCD; (c) CCD image from setup shown in part a; (d) CCD image from setup shown in part b; (e) Film image from setup shown in part b.