

## X-ray Diffraction of Irregularly Shaped Samples Using Göbel Mirrors

*Göbel Mirror - parallel beam - phase identification - non-flat sample surface*

Bragg-Brentano parafocusing geometry has been the most widely used in the powder diffraction field. This geometry is ideal for flat samples and samples that can be made into a powder. However, there are many irregularly shaped samples that are either too valuable to be destroyed and made into a powder or are just not feasible to run in that geometry. The only way to measure these samples and obtain a useful pattern was to simulate parallel beam geometry with tight slit configurations and/or thin film optics. This enabled a well-resolved pattern to be collected at the expense of intensity. Today, with the advent of Bruker's Göbel Mirror optics, these problems no longer plague the diffractionist. Göbel Mirrors provide the intensity that is needed along with a collimated, parallel beam that enables accurate measurements from irregularly shaped samples.

### Instrumentation

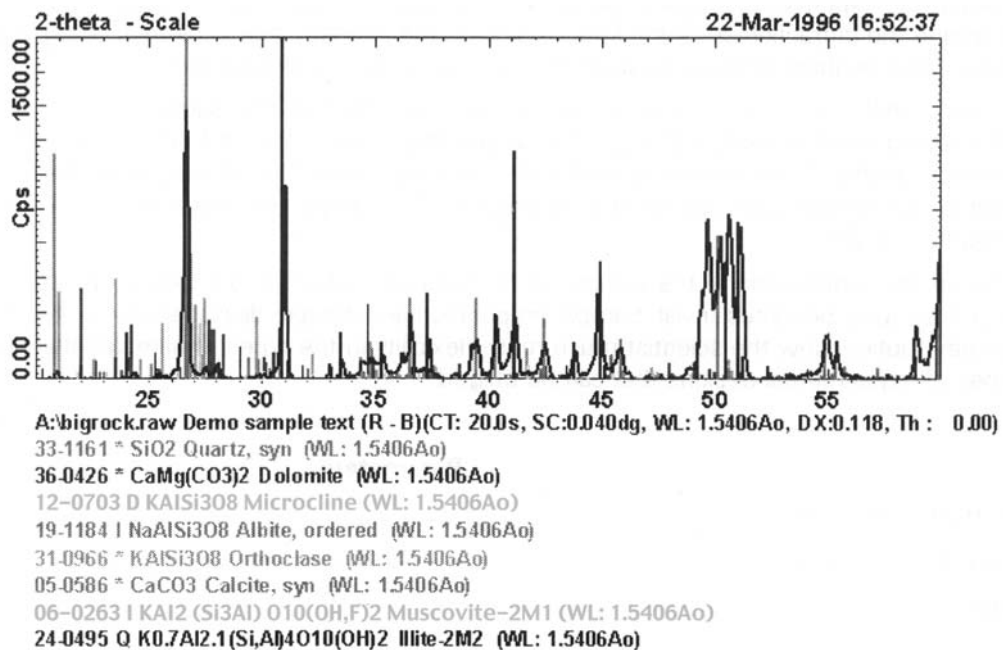
- Bruker's D5000  $\theta/2\theta$  Diffractometer
- 2.2 kW Cu long fine focus X-ray tube
- Göbel Mirror optics
- Rock specimen mounted on a lab jack
- thin film diffracted-beam optics (0.4° divergence)

To demonstrate this fact, a diffraction pattern from a rock sample was collected. The sample was 18 x 9 x 7 inches (46 x 23 x 18 cm) and weighed 60 lbs (27 kg). The sample stage was removed from the goniometer, and the sample was placed on a lab jack and moved vertically into the X-ray beam. Due to the parallel beam optics, the vertical placement of the sample does not affect peak position. The sample was not moved. Only the 2 $\theta$  arm was scanned to obtain the pattern.

The plot shown is the phase identification of the sample. With Bruker AXS' Göbel Mirrors, phase identification of large, irregularly shaped samples becomes trivial. Sample preparation and sample displacement problems are no longer issues. These new optics allow the scientist much more flexibility in the types of samples that can be analyzed and the types of experimental designs that can be utilized.

### Parameters

- 40 kV, 50 mA
- $\theta$  held constant
- $2\theta = 10^\circ - 120^\circ$
- Step size = 0.04°



BRUKER AXS GmbH  
ANALYTICAL X-RAY SYSTEMS

D-76181 KARLSRUHE  
GERMANY

TEL. (+49) (721) 595-2888  
FAX (+49) (721) 595-4587  
<http://www.bruker-axs.de>

BRUKER AXS, INC.  
ANALYTICAL X-RAY SYSTEMS

6300 ENTERPRISE LANE  
MADISON, WI 53719-1173 U.S.A.

TEL (+1) (800) 234-XRAY  
TEL. (+1) (608) 276-3000  
FAX (+1) (608) 276-3006  
<http://www.bruker-axs.com>  
Email [info@bruker-axs.com](mailto:info@bruker-axs.com)

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