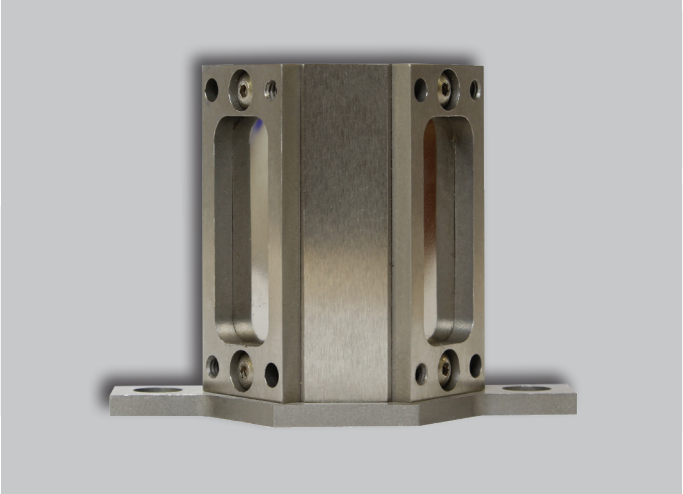
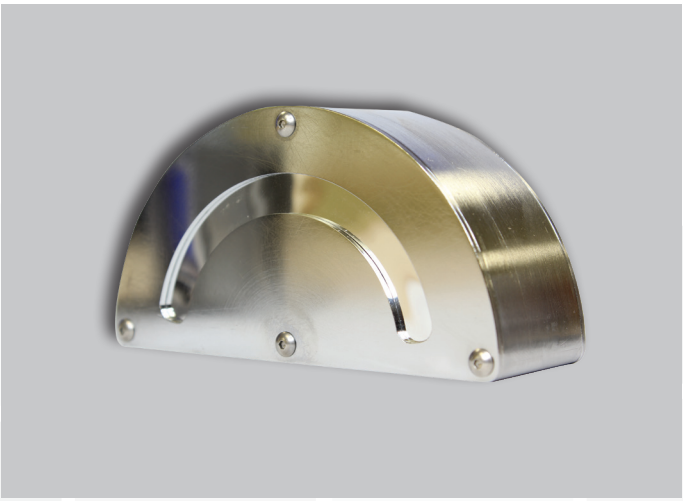
Improved Performance with Doubly Curved Crystal Optics

Highly monochromatic X-ray beams focused in three dimensions can be obtained by using Doubly Curved Crystals (DCC). Crystals of mica, graphite, silicon, germanium, and others are used for an energy range of 1.5 to 58.KeV. Crystal optics reflect X-rays based on Bragg diffraction.





Doubly Curved Crystal Optics

Features & Benefits

- 3-Dimensional point-to-point focusing of X-ray
- Highly monochromatic beam
- Large capture angle
- High flux density gain
- Large working distance
- Extremely low background
- High detection sensitivity

Applications

- Monochromatic XRF
- Single crystal XRD
- Powder XRD
- Small feature analysis
- X-ray reflectometry (Metrology)
- X-ray imaging offers good P/B ratio to improve contrast for medical application
- WDS (Wavelength Dispersive Spectrometry)

Custom DCC Optic Solutions

XOS offers custom DCC optic solutions optimized for your application needs.

Table 1: Typical Performance Specifications of DCC Optics

Element	Focusing E (keV)	Focal Length (mm)	Collection Solid Angle (sr.)	Focusing Spot (µm)
Cr	5.4	≥ 100	≤ 0.015	200
Cu	8	≥ 100	≤ 0.004	100
Mo	17.5	≥ 120	≤ 0.001	100
Rh	20.2	≥ 150	≤ 0.001	150

Note: Specs are for single segment optic using an X-ray source with source size less than 100µm

Figure 1: Basic layout of monochromatic EDXRF analysis using a DCC optic.

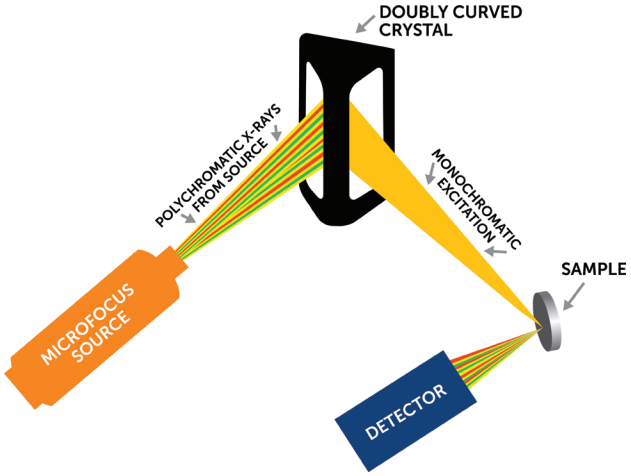


Figure 2: Bragg diffraction geometry used to define the characteristic of DCC.

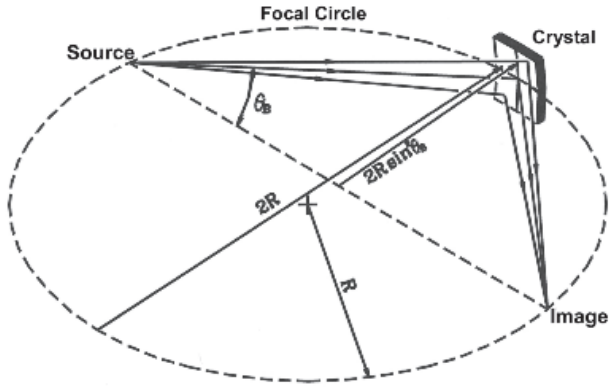
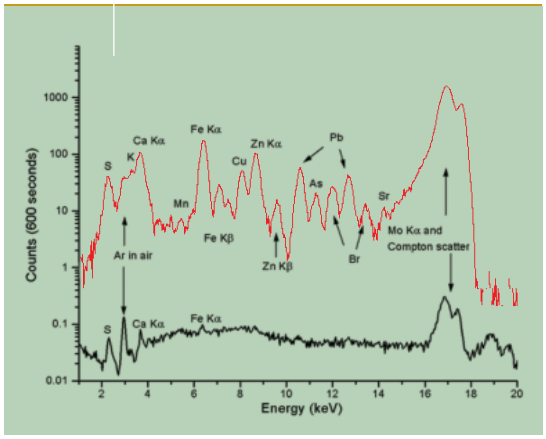


Figure 3: Comparison of monochromatic EDXRF and traditional XRF for elemental analysis of concentrated air particulates. This study was performed with the following parameters: 40kV, 20W, 200s.



Pinhole, 50 micron diameter
DCC optic, 50 micron focal spot

Figure 4: Elemental mapping of bioessential metal distributions in tissue samples for diagnosis of health disorders. Figure 4 shows Neurodegenerative disease iron map. This study was performed with the following parameters: 50kV, 1mA, 6μm steps, 25s per step.