

Product Sheet SC-XRD 44

MONOCAP™ and MIRACOL™

High Intensity Monocapillary Optics

X-rays are very efficiently reflected off glass surfaces when the angle of incidence is low. By producing carefully shaped glass optics, it is possible to use this total external reflection to focus and collimate X-ray beams.

The solid angle from the X-ray source to the monocapillary glass optics is relatively large, which means that coupling between the two is efficient. As a result, high intensities of X-rays can be channeled into the capillary, and since reflection itself is very efficient, capillaries can be used to generate high-intensity X-ray beams.

Bruker MONOCAP™ and MIRACOL™ optics provide high-intensity capillary optics solutions. They collimate the X-ray beam spatially and angularly. Monocapillaries of 0.1 mm, 0.3 mm, 0.5 mm and 1.0 mm in diameter make it possible to significantly increase the radiation intensity on a sample relative to conventional double pin-hole collimators with virtually no additional beam spread.

MONOCAP and MIRACOL optics are suited for Cu and Mo X-ray wavelengths, and provide spot sizes between 0.1 mm and 1 mm in diameter for the MONOCAP and 0.3 mm and 0.5 mm in diameter for the MIRACOL. Both the MONOCAP and the MIRACOL are interchangeable with the standard pin-hole collimator.



Adding a monocapillary optic is the most cost-efficient way to increase your source intensity.

Monocapillary Optics

Monocapillary optics (MONOCAP/MIRACOL) are the most cost effective way to increase the performance of your diffractometer. Adding a monocapillary optic to a system will increase source intensity by a factor of 1.3 to 2 for Mo and 2 to 5 for Cu. Monocapillary optics are available for all Bruker systems that use flat graphite crystal monochromators.



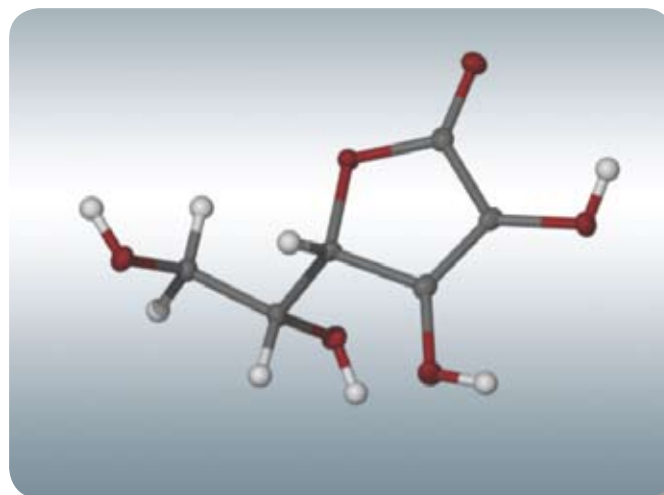
MONOCAP (top) and MIRACOL (bottom) glass capillary optics are interchangeable with standard collimators.

	Intensity Gain (Cu)	Intensity Gain (Mo)
MONOCAP (available in 0.1, 0.3, 0.5 and 1 mm beam sizes)		
SMART 1K	4-5	2
SMART 1000	4-5	2
SMART APEX	4-5	2
SMART APEX II	4-5	2
MIRACOL (available in 0.3 and 0.5 mm beam sizes)		
KAPPA CCD	2	1.3
KAPPA APEX	2	1.3
KAPPA APEX II	2	1.3

Intensity gain with monocapillary optics. Note that a monocapillary yields a larger relative intensity gain for SMART systems than KAPPA systems because of the latter's shorter beam path.

For comparison, room temperature data were collected on a small sample of ascorbic acid ($0.07 \times 0.16 \times 0.18 \text{ mm}^3$). Data were acquired with 30s/1.0° scans for the 0.5 mm collimator and 12s/1.0° scans for the MONOCAP capillary. Complete, 2.5-fold redundant data extends to 0.75 \AA in both cases and although the exposure time for the MONOCAP data is 2.5 times shorter, the data are of comparable quality:

	MONOCAP	Collimator
Data collection time (h)	1.5	3.3
Data all	3764	3771
Data observed, $F_0 > 4s(F_0)$	2806	2842
Rint	2.43%	2.08%
Rsigma	5.03%	4.62%
R1	4.54%	4.85%



Ascorbic acid (Vitamin C), $\text{C}_6\text{H}_8\text{O}_6$, $P2_1$, $a=6.4075(7) \text{ \AA}$, $b=6.3510(7) \text{ \AA}$, $c=17.1253(18) \text{ \AA}$, $\beta=99.345(1)^\circ$

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