

**Focusing Polycapillary Optics**

Ultra-High-Resolution EDS Detectors

Polycapillary optics make it possible to commercially utilize superconducting ultra-high-resolution EDS detectors.

**Features:**

- Combines high energy resolution of WDS systems with parallel energy detection capabilities of EDS detectors
- 7.2eV energy resolution @ Mn Kx (5.89 keV) [NIST transition edge sensor]
- Increased sensitivity for detection of low Z elements (B, C, N, O; 4eV energy resolution @ 1-1.6keV)
- An increase in effective detector area of >100X due to large collecting solid angle of polycapillary optic

**Benefits:**

- Energy resolution >10X compared to current EDS detectors
- Resolution of low energy x-ray lines
- Chemical state identification and quantification
- Small Particle (<0.1 µm) and thin film analysis without excitation of substrate by using low excitation energies
- Fast measurement times (no scanning required as in WDS)

**Figure 1:**

The x-ray optic collects x-rays emanating from the sample and focuses them onto the detector

Unprecedented composition and chemical state analysis:

**Figure 2:**

Comparison of spectra obtained from 100 nm WSi$_2$ thin film on SiO$_2$ substrate collected with Microcalorimeter and EDS spectrometer

Closely spaced W- and Si- lines are easily resolved by the Microcalorimeter. Lines which are indistinguishable with an EDS spectrometer.


**Figure 3:**

Microcalorimeter and EDS spectra for BaTiO$_3$

A Microcalorimeter spectrum of the technologically important material BaTiO$_3$, compared with an EDS spectra, which again shows the superb energy resolution of the Microcalorimeter which makes it possible to almost completely resolve the Ba L$_\alpha$ and Ti K$_\alpha$ peaks


**Figure 4:**

Determination of chemical bonding effects in Fe and FeO-OH due to Fe L$_{α1/2}$ line shifts

The improvement in achievable energy resolution of the Microcalorimeter allows Microcalorimeter EDS measurements of chemical shifts in x-ray spectra. Fig 4 shows a comparison of Microcalorimeter and WDS data.