SIGRAY

Sigray AttoMap™-200

X-RAY MICROXRF WITH SYNCHROTRON CAPABILITIES

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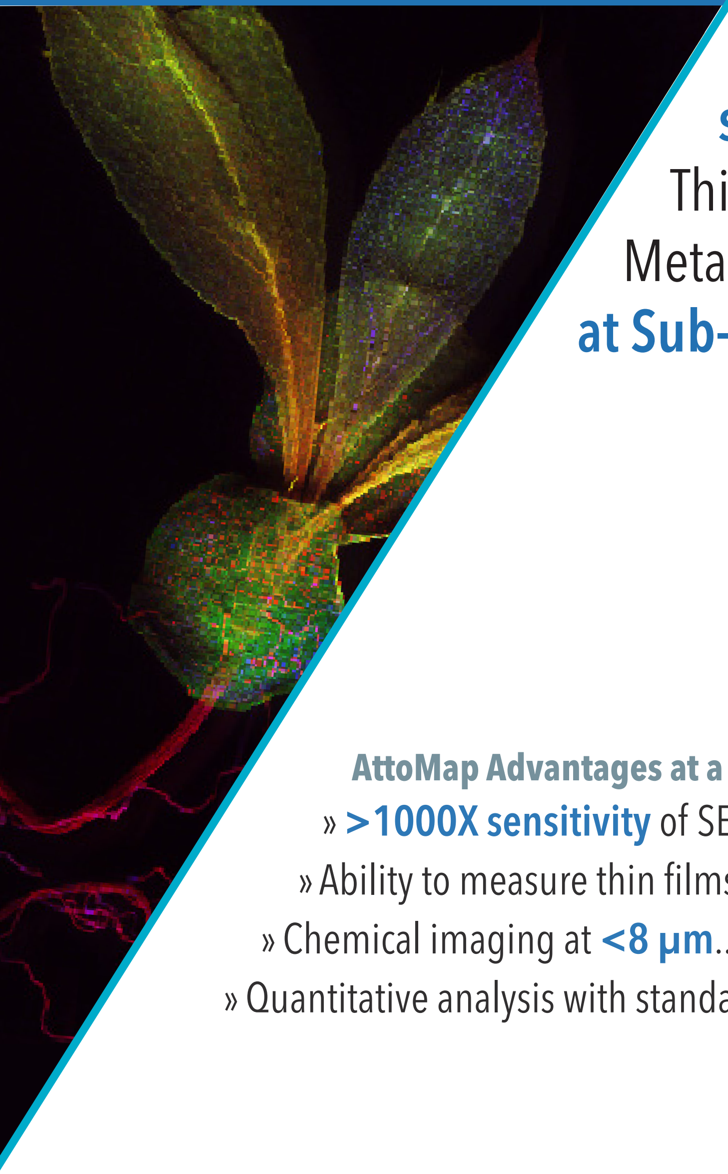
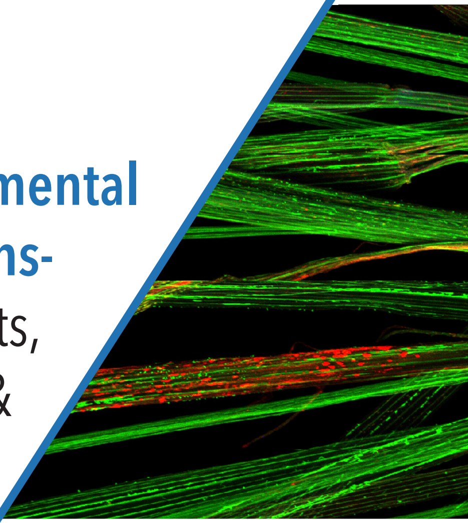
Biological application: Hyperaccumulating seedling with elements of interest of K (Blue), Cl (Green), S (Red) shown and trace accumulation of Ni, Mn in roots detected

Sample provided by Dr. Antony van der Ent and Dr. Peter Erskine, The University of Queensland, Australia



Quantitative Elemental Mapping at Microns-scale for Contaminants, Thin Films, Mineralogy & Metallomics Research at Sub-PPM Sensitivity



AttoMap Advantages at a Glance

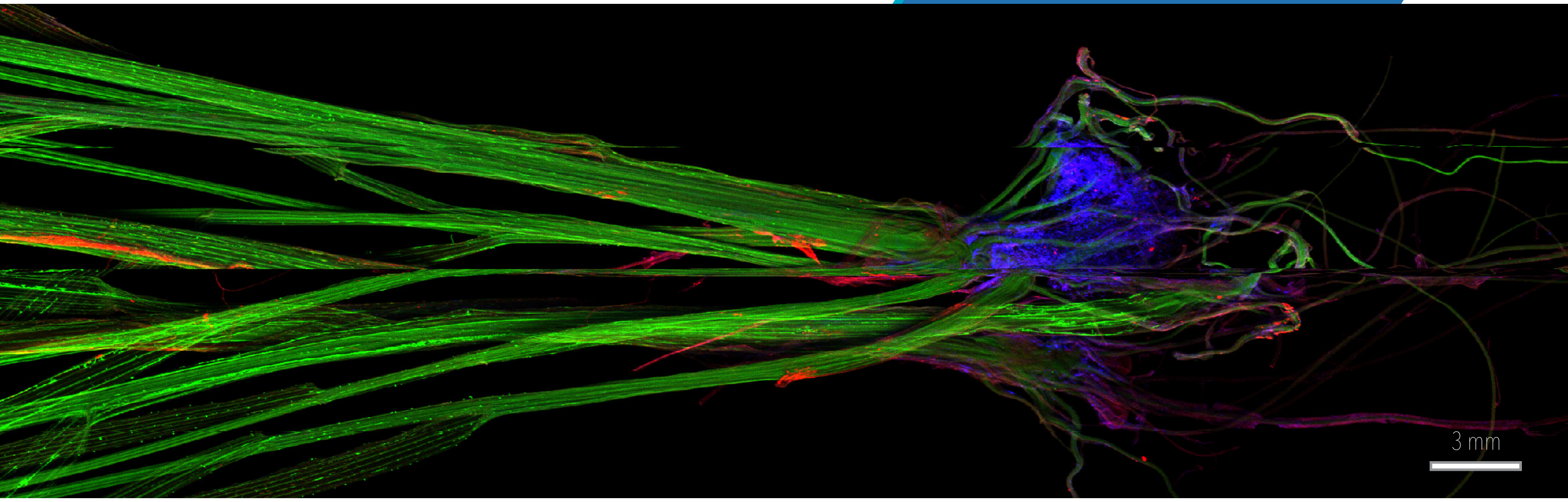
» **>1000X sensitivity** of SEM-EDS for simultaneously acquiring a range of elements

» Ability to measure thin films and dopants at **sub-angstrom** sensitivity

» Chemical imaging at **<8 µm**... and down to **5 ms/point**

» Quantitative analysis with standards-based or standardless approaches

Elemental mapping of a turf grass control (comparison was performed vs. Cd-treated grass sample). RBG corresponds to K (green), Ca (red), and Mn (blue).



Bring Synchrotron XRF Capabilities to Your Lab

Conduct Ground-breaking Research without Needing to Apply for Beamtime

Sigray's AttoMap™ microanalytical system provides a breakthrough in lab-based microXRF performance, bringing synchrotron capabilities to individual laboratories.

What is MicroXRF?

Micro x-ray fluorescence (microXRF) is a powerful spatially-resolved elemental mapping and chemical microanalysis technique originally developed and advanced at x-ray synchrotron sources. The technique uses a microfocused x-ray beam that is rastered across the surface of a sample. These x-rays will excite atoms within the sample and result in the production of characteristic x-rays that can be used to determine the elemental composition of the sample.

Why Sigray's Approach to MicroXRF?

The AttoMap provides unprecedented sensitivity to detect elements that were previously undetectable with electron-based techniques and other microXRF systems. Its performance is enabled by patented innovations: Sigray's ultrahigh brightness multi-energy x-ray source and Sigray's high efficiency double paraboloidal x-ray optics. The instrument provides fast, non-destructive chemical mapping at single digit microns resolution with times down to 5 milliseconds per point.

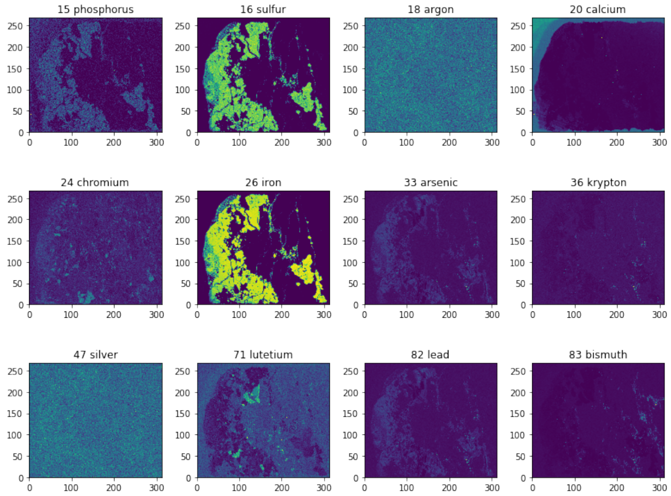


Figure 1: Example output of the AttoMap of a mineralogical sample, showing several selected channels for elements of interest. Quantitative weight percent composition can be calculated using standards or through standardless Fundamental Parameters routines, and the result can be segmented based on mineralogy with software.

Research Applications of the AttoMap™

Application	AttoMap™ Advantage over Other Approaches
Semiconductor	Residue from masks (Ni, Co, etc.) between steps with sensitivity down to sub-Angstrom Thickness measurement of high-k dielectrics and other thin layers Failure analysis of buried failures (e.g. misalignments) and of contamination (non-destructive)
Biology / Metallomics	Metallomics: mapping and measurement of pathological dysregulation of elements and toxicology Upstream complement to MALDI, LA-ICP-MS, and SIMS on hydrated samples
Batteries & Fuel Cells	Analysis of loose particles and contaminants for industrial processes
Pharmaceutical	Nanoparticle distribution in tissue and cells of nanoparticles down to 50 nm
Geology	Quantitative mineralogy of trace and rare earth elements for gemstones MLA and QEMSCAN complement with higher sensitivity
Materials Science	Distribution of elements in alloys (whiskers), glasses, plastic additives, concrete, and more Can be used to analyze samples *in situ* to observe compositional changes

System Specifications

Parameter	Specification
Spot Size	High Resolution (<10 µm)
Sensitivity	Sub-ppm relative detection sensitivity and capable of mapping trace elements. Picogram to femtogram absolute sensitivity (element & acquisition time dependent)
Additional Capabilities	Optical microscopy and x-ray transmission microscopy included
Footprint	54" W x 65.5" H x 38.5" D
Maximum Sample Size	50 cm x 50 cm | 15 cm thickness
Source	Sigray High Brightness Microfocus Source
Target Material	Dual Energy Option, includes selection from: Cr, Cu, Rh, W, Mo, etc.
Power | Voltage | Current	50 W | 20-50 kV | 4 mA
X-ray Optic	Sigray Twin Paraboloidal X-ray Optics (matched to each target material)
Transmission Efficiency	~80%
Working Distance	10 - 50 mm (customizable)
Interior Coating	Platinum (increases NA of optic significantly)
X-ray Detectors	SDD Detector and an X-ray Camera Optional 2nd SDD Detector
Energy Resolution	<125 eV at Mn-Ka

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