



## Rocky Mountain Laboratories, Inc.

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 Phone: (303) 526-9449 Fax: (303) 526-0877  
 (800) PRO-LABS [776-5227]  
 www.RockyMountainLabs.com

### Instrument Specifications

### Capabilities Note

Capability	XPS/ESCA	Auger	EDS/EDX	SIMS
Principal Input Output	X-rays Electrons	Electrons Electrons	Electrons X-rays	Ions Ions
Model	Kratos Axis HSi	PHI 610	iXRF Model 510D	PHI SIMS II
Information	Elemental Chemical Depth profile	Elemental Chemical Depth profile	Elemental Best mapping Line scanning	Elemental (DSIMS) Chemical (SSIMS) Isotopic Depth profile
Smallest area	30 mm diameter	1 mm diameter	1-5 mm diameter	200 mm diameter
Largest area	2 mm x 0.8 mm	1 mm diameter	50 x 70 :m	1 x 1 cm
Smallest feature	~ 25 nm	0.5 mm	1 mm	400 nm
Smallest sample	10 mm (fiber)	10 mm (fiber)	1 mm	10 mm (fiber)
Largest Sample	¼" x 4" 7 mm thick	2.5 cm diameter 5 mm thick	2.5-5 cm or 10 cm	2.5 cm diameter 5 mm thick
Analysis depth	1-10 nm with tilt 3-30 monolayers	5-10 nm 10-15 monolayers	1-5 nm @ 20 keV	<3 nm (SSIMS) surface monolayers any depth (DSIMS)
Spatial resolution	10 mm lateral 1 Å depth	0.2 mm lateral <5 nm depth	10 nm	1 mm (SSIMS) 200 mm dyn. Image 5 nm depth
Spectral resolution	0.48 eV; Ag 3d <sub>5/2</sub>	dE/E = 0.3%	145 eV @ Mn	1 amu
Sensitivity	0.005-1 atom%	0.1-2 atom%	0.05-2%	<<1 atom%(DSIMS)
Accuracy	±20%	±20%	±5% with standards	±100%
Precision	±0.5%	±5%	±2%	±1%
Best samples	All nonvolatile	Conductors Thin films	Conductive	SSIMS: well ordered polymers DSIMS: oxides
Worst samples	Outgassing Nonhomogeneous	Outgassing Thick insulators	Outgassing	Outgassing
Best elements	Heavy elements	S, Cl, Ar, K, Pd, Ag, Cd, In, Sn	High Z	Halogen (-ions) Noble metal (+ions) 511 amu max.
Worst elements	No H or He Interferences: B/P, Ba/Co, Mn/Ni	No H or He Interferences: S/Mo, N/Ti, Cr/O	Low Z (no Z<B)	Nobel gases High amu
Matrix effects	Little	Moderate	Moderate	Large
Quantification	Excellent	Good	Good	Good with close standard
Analysis time	20 min – 2 hr	15 min – 2 hr	10 min – 1 hr	15 min – 2 hr
Sputter rate	>10 nm/min SiO <sub>2</sub> @ 2 kV with Ar <sup>+</sup>	>10 nm/min SiO <sub>2</sub> @ 2 kV with Ar <sup>+</sup>	N/A	>10 nm/min SiO <sub>2</sub> @ 2 kV with Ar <sup>+</sup>
Destructive	No	No	No	Yes
Unknown survey	Good	Good	Good	Poor
Magnification		5,000X		



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### Capabilities Note

Capability	FTIR	Raman	SEM	FESEM	SPM
Principal Input Output	Absorption IR IR	Light Light	Electrons Electrons	Electrons Electrons	AFM & SPM Piezoelectric Feedback
Model	Thermo Scientific Nicolet iN10MX	Renishaw RM1000	JEOL 6400	JEOL 6320F	Veeco DI Dimension 3100 Nanoscope™ IV
Information	Chemical	Chemical	Topographical Atomic # (Z) with backscatter	Topographical	Topographical Magnetic field intensity
Smallest area	10 mm diameter	1 mm	1.5 mm diameter	100 nm	No limit
Largest area	300 mm diameter	20 mm	7.5 mm diameter	100 mm	125 x 125 mm
Smallest feature	10 mm (5 mm fiber)	0.5 mm	10 nm	1 nm	5 nm
Smallest sample	10 mm	0.5 mm	1 mm	1 mm	5 mm
Largest Sample	15 x 30 cm	2" tall 3" x 3"	2.5-5 cm or 10 cm	2.5-5 cm	1.5 cm diameter x 1 cm high or 15 cm long (Dim 3000)
Analysis depth	2 mm - mms	2 mm	2-5 nm	2-5 nm	5 mm max. relief
Spatial resolution		1 mm	10 nm @ 100,000X	1.2 nm @ 300,000X	<1 nm lateral <1 Å vertical
Spectral resolution	0.5 cm <sup>-1</sup>	4 cm <sup>-1</sup>			
Sensitivity	1 ppm	1 pp thousand			1 Å vertical
Accuracy			±2%	±2%	±1% or 5 nm
Precision			±1%	±1%	±2%
Best samples	Organics Liquids & solids KBr pellets	Organics (double bonds) Solids	Conductive	Conductive Better on insulators than SEM	Smooth
Worst samples	Opaque in IR Transparent in IR Multicomponent	Fluorescing Materials Mixtures	Outgassing	Outgassing	Macroscopically rough Mobile surface features
Best elements	Requires molecular bonds	Requires molecular bonds	Highest )Z for backscatter	N/A	
Worst elements	Weak IR absorber Metal compounds Salts	Metals, Minerals		N/A	
Matrix effects	Water	Mixtures a problem			
Quantification	Poor	Poor	Good	Excellent	Excellent
Analysis time	10-30 min	30-60 min	10-30 min	10-30 min	30-60 min
Destructive	No	Laser may melt samples	No	No	No
Unknown survey					
Magnification			15-300,000X	1,000-650,000X	200,000X