

Thermo Scientific MagnaRay



Wavelength Dispersive X-ray Spectrometer



Resolution



Sensitivity



Quantification



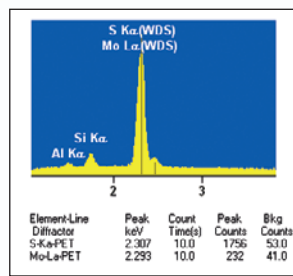
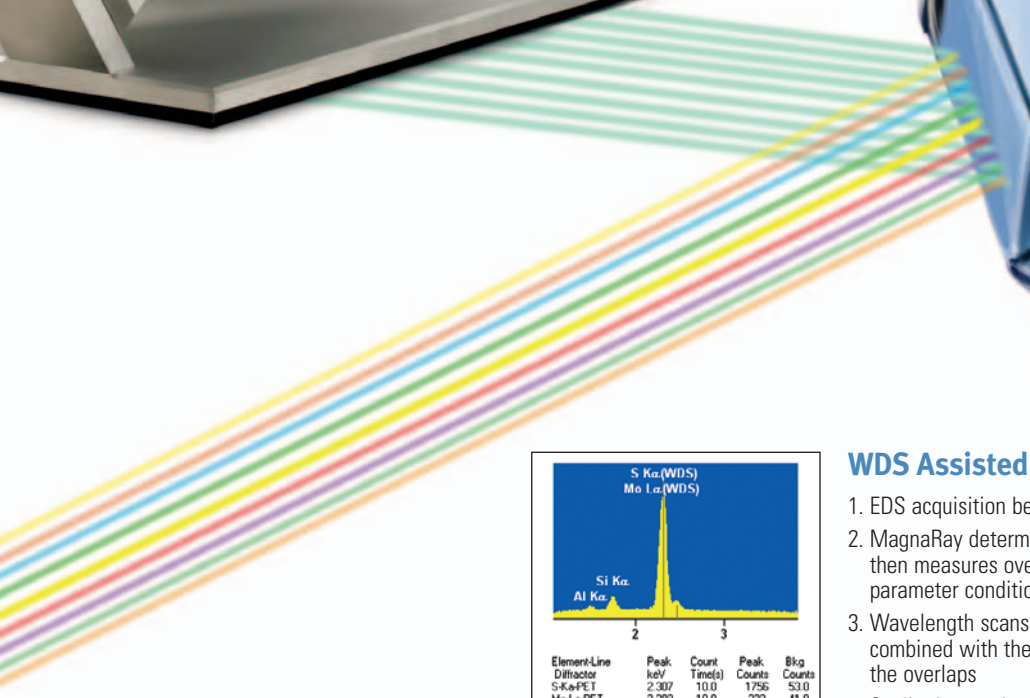
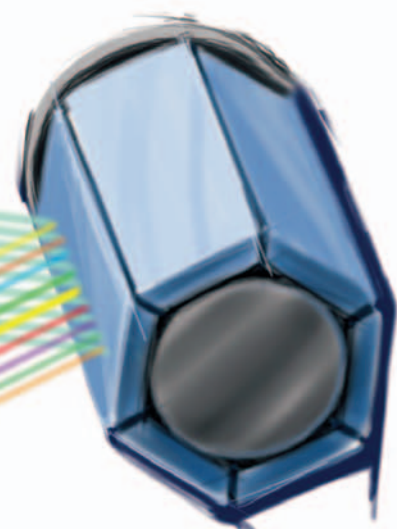
Identification



Enabling Nanoscale Analysis

Superb peak-to-background ratios and extreme X-ray collection rates make WDS suitable for trace elemental analysis. With older WDS technology, the spectrometer dictates the operating conditions of the SEM. Older instrumentation typically requires beam voltages starting at 10 kV with beam currents greater than 10 nA resulting in a large electron beam spot size and potential sample damage. With the MagnaRay, operating conditions are dictated by the sample and the SEM – not the spectrometer. Modern nanoscale materials require SEM operating conditions under 5 kV, with a probe diameter

less than 10 nm, and at times using less than 1 nA beam current. Designed exactly for these extreme operating conditions, MagnaRay makes SEM-based nanoanalysis a reality. MagnaRay also solves sample charging and sample damage problems commonly encountered with high-energy high-current traditional WDS. MagnaRay is also ideal on samples where a small interaction volume is critical, such as nano-particles or thin films. MagnaRay gives you the best features of WDS, without the detrimental requirements of high acceleration voltage or high beam current.



WDS Assisted Qualitative Analysis

1. EDS acquisition begins
2. MagnaRay determines potential peak overlaps then measures overlapped peak using optimum parameter conditions
3. Wavelength scans automatically collected and combined with the EDS spectrum to illustrate the overlaps
4. Qualitative results perfected using the WDS results

Quantitative Analysis

WDS quantification has traditionally required close attention to sample position, beam current and spectrometer setup. The embedded expert system of MagnaRay has made those concerns unnecessary. Alignment of the spectrometer is handled automatically when it is needed. Using information from the EDS spectrum, MagnaRay chooses the most appropriate element and aligns the sample and spectrometer for optimum operation. Beam current measurements are automated as well, ensuring accurate quantitative results.

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Filter Fit With Standards Chi-squared value: 6.072 Errors: +/-1 Sigma

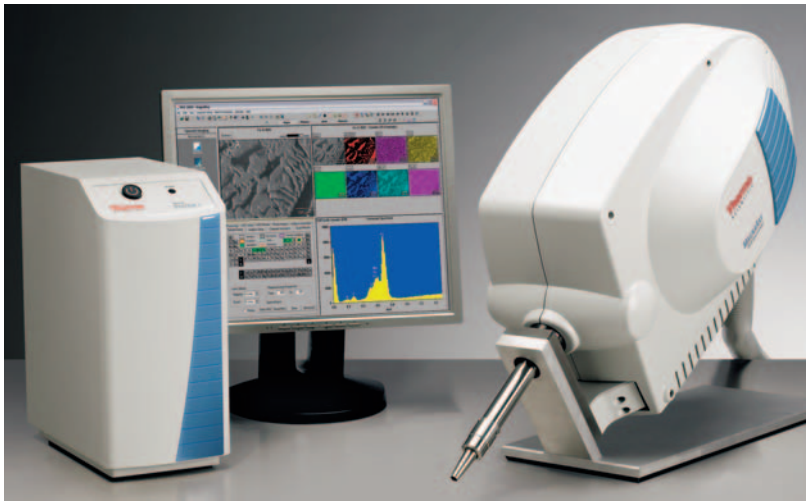
Correction Method: Proza (Phi-Rho-Z)

Acc. Voltage: 20.0 kV Take Off Angle: 53.3 deg(EDS) 35.0 deg(WDS)

Element	Net	Source	Element	Wt. %	Standard
Line	Counts		Error		Name
Si K+	603	WDS	0.79	+/-0.04	Si Std
Cr K	78944	EDS STD	18.47	+/-0.12	Chromium Standard(2)
Mn K+	1089	WDS	1.82	+/-0.07	Mn Std
Fe K	161043	EDS STD	63.01	+/-0.31	Iron Standard(1)
Ni K	24897	EDS STD	14.84	+/-0.15	Nickel Standard(1)
Mo L+	842	WDS	3.66	+/-0.14	Mo Std

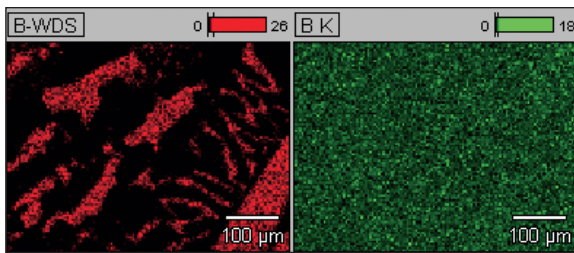
Total +WDS Element 102.59

X-ray Maps and Linescans Par Excellence



Traditional EDS X-ray maps and linescans display integrated peak counts. This data includes both characteristic elemental X-rays and background Bremsstrahlung X-rays. At low energies, the background can become quite high, which results in a low peak-to-background ratio and low contrast X-ray maps or linescans. The WDS technology in MagnaRay provides inherently higher peak-to-background ratios, producing X-ray maps and linescans with high contrast for

low concentration materials. Acquisition of WDS maps and linescans are no more difficult than selecting an elemental line in the periodic table of the NORAN System 7 software. All of the spectrometer settings are automatically set to the best operating conditions possible for that line. Complete transparent WDS integration within the NORAN System 7 software means that an EDS operator is already trained for WDS analyses.



WDS

EDS

MagnaRay WDS demonstrates the ability to detect and map trace levels of elements. The concentration of Boron in this steel sample is less than 3%. The WDS (red) map clearly shows contrast in the image as compared to EDS map (green).

In addition to these offices, Thermo Fisher Scientific maintains a network of representative organizations throughout the world.

Africa

+43 1 333 5034 127 • analyze.emea@thermo.com

Australia

+61 2 8844 9500 • analyze.au@thermo.com

Austria

+43 1 333 50340 • analyze.at@thermo.com

Belgium

+32 2 482 30 30 • analyze.be@thermo.com

Canada

+1 800 530 8447 • analyze.ca@thermo.com

China

+86 10 8419 3588 • analyze.cn@thermo.com

Denmark

+45 70 23 62 60 • analyze.dk@thermo.com

Europe - Other

+43 1 333 5034 127 • analyze.emea@thermo.com

France

+33 1 60 92 48 00 • analyze.fr@thermo.com

Germany

+49 6103 408 1014 • analyze.de@thermo.com

India

+91 22 6742 9434 • analyze.in@thermo.com

Italy

+39 02 950 591 • analyze.it@thermo.com

Japan

+81 45 453 9100 • analyze.jp@thermo.com

Latin America

+1 608 276 5659 • analyze.la@thermo.com

Middle East

+43 1 333 5034 127 • analyze.emea@thermo.com

Netherlands

+31 76 579 55 55 • analyze.nl@thermo.com

South Africa

+27 11 570 1840 • analyze.sa@thermo.com

Spain

+34 914 845 965 • analyze.es@thermo.com

Sweden / Norway / Finland

+46 8 556 468 00 • analyze.se@thermo.com

Switzerland

+41 61 48784 00 • analyze.ch@thermo.com

UK

+44 1442 233555 • analyze.uk@thermo.com

USA

+1 800 532 4752 • analyze.us@thermo.com

www.thermo.com



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