ISSUE 1 / 2015

X'PRESS

HOW TO EXCEL?

PANalytical
get insight

Welcome to this issue of our **X'Press magazine**

Pieter de Groot
Corporate marketing director

'How to excel? ' is the central theme of this first issue of X'Press in 2015. This is indeed an important question in a world with ever-increasing competition where it is essential to be noticed in order to be selected. And how else can you be noticed than by being better than others or excelling.

Our main example of excellence is the center of this issue: the brand-new Zetium X-ray fluorescence spectrometer, which was launched in early March at PITTCON in the US. A revolutionary combination of X-ray techniques together with the highly intuitive software provide elemental excellence all along the line. Dedicated industry editions and packaged solutions can be fine-tuned to the user's needs. X'Press asked one of the 'fathers' of this new system about the development process of such a system. His answers and his thoughts about excellence are presented in our interview with Simon Milner, product marketing manager XRF.

Just before PITTCON, all PANalytical employees were introduced to Zetium's excellence during an exciting INSIGHT WEEK, which was held at PANalytical's headquarters in Almelo, the Netherlands. A spectacular launch show was followed by more sober but nevertheless fascinating training sessions on various products from PANalytical's portfolio for all our customer-facing employees.

We further present you a number of examples of excellence where PANalytical has been involved. The lead smelter Berzelius in Germany could considerably improve the safety of its employees by introducing a small laboratory automation installation and at the same time achieve even better control of their production process. R&D Carbon in Switzerland provides excellent expertise on any aspect of carbon electrodes in the aluminium industry. PANalytical equipment helps them to an even better understanding of the behavior of carbon electrodes at the various stages of their lifetime.

We hope that these and the other articles give you some reading pleasure and provide an inspiring view on an excellent year.

With kind regards,
Pieter de Groot

LATEST NEWS

PANalytical Award

For the 4th time in a row the PANalytical Award is now open for submissions.

Aiming at promoting exceptional young scientists the award honors an outstanding journal article dealing with the use of a laboratory X-ray source as the main analytical technique. There are no restrictions placed on the manufacturer of the X-ray equipment used.

Closing date for applications is 1 December 2015.

Promoting exceptional young scientists

www.panalytical.com/award

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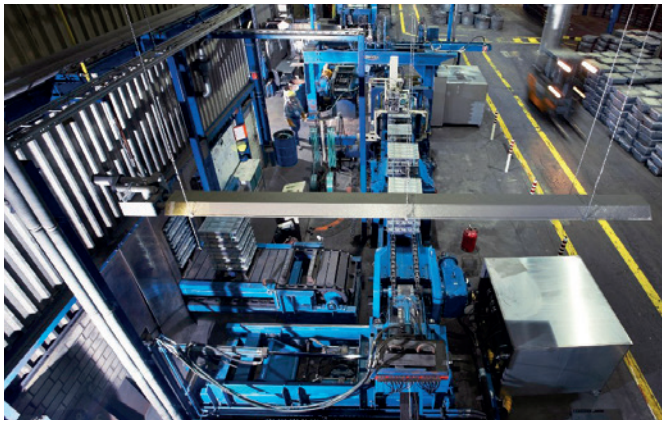

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Excelling in lead production

BBH Stolberg bought its first PANalytical Axios X-ray fluorescence spectrometer in 2006. This system has since been used extensively for the analysis of slag from the QSL reactor and for analysis of intermediate products in lead refining. Samples are taken from strategic production steps, milled, pressed in steel holders and subsequently analyzed. The precise knowledge of elemental concentrations in the various process steps enables the optimization of the production process and is used for registration of material flows.

The Axios has been an extremely reliable workhorse for many years. BBH's lab manager Dr. Christian Schramm is especially happy with its very high uptime and reliable service whereas the operators appreciate the ergonomics of the instrument and the intuitive user interface of the software. That's why BBH didn't hesitate to purchase a second system when the need for additional capacity came up.

For this new system BBH additionally required the possibility to insert samples into the instrument without an operator needing to enter the conditioned spectrometer room. This way contamination of the spectrometer and the surrounding lab area by the toxic lead and its compounds is minimized.

Two belts are now connecting the Axios instrument with the adjacent sample prep room through a hole in the wall. The operator places the samples for measurement on one belt from which they are picked up by the Axios sample changer. The other belt returns the samples after the measurement. The SamTracs software together with a customized, touch-screen-based sample introduction software, minimizes operator errors.

With this new installation BBH Stolberg is now ready for many more years of reliable process control without the risk of contaminating their lab space.

"We are very satisfied with the fast and professional installation of our new Axios system. It was ready for daily work within a very short time thanks to the great support during and after the start-up period."

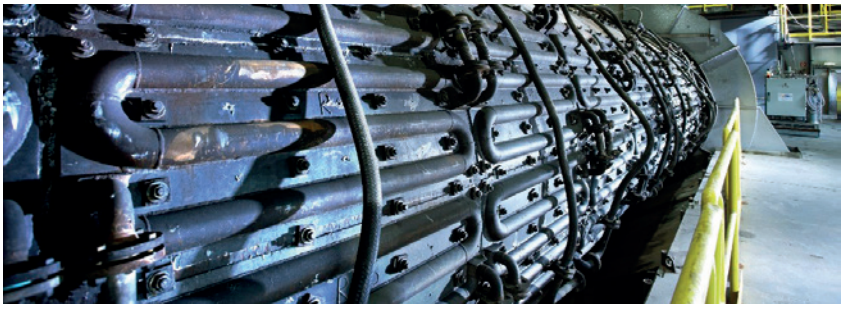
- Dr. Christian Schramm, lab manager at BBH Stolberg

Lead production

For its production of primary lead, BBH Stolberg relies on the environmentally friendly and energy-saving technology of the QSL process (named after the inventors Queneau, Schumann and Lurgi). Here, lead concentrates and secondary raw material are heated to 1200 °C under oxygen in the QSL reactor, a slightly tilted 33 m long cylindrical pipe.

At various locations of the reactor the products can be harvested and further processed. For example sulfur dioxide gas is converted into sulfuric acid and lead is further purified.

Primary lead from Stolberg is used for batteries and accumulators in the automotive industry, in accumulators for emergency power supply and in the solar industry. The high-grade material from Stolberg is indispensable for manufacturing optical glass and lenses, for protection against radiation as well as against acids, and more.



BBH STOLBERG

BERZELIUS Bleihütte (BBH) Stolberg, situated in the far west of Germany, is one of the largest and most modern lead smelters in the world. About 240 employees are responsible for an annual production of 150,000 tonnes of lead and lead alloys, along with 130,000 tonnes of sulfuric acid.
The product portfolio also contains auriferous silver ('Güldischsilber') consisting of 99.6% silver along with some gold and platinum. Copper/lead matte and BERZELIT® slag complete the product range.

The company is certified in occupational safety, health, and environmental management as well as in quality, energy management and is a certified waste management company.

Combining technologies – PANalytical's new Zetium spectrometer

Simon Milner, product marketing manager X-ray fluorescence about 'How to excel'

During the past year Simon Milner and his team have focused on the introduction of PANalytical's newest product: the Zetium X-ray fluorescence spectrometer, which is presented on the following pages of this X'Press magazine. As not only the technology incorporated in this new system is exciting but also the thoughts behind it, the editors asked one of Zetium's creators about this new system and how it will contribute to excellence.

Simon, what has driven the development of this new XRF system?
The main driver for developing this new system is our philosophy of providing our customers with technology and solutions that give them the edge in their endeavors, whether process optimization, quality control or research.

Zetium is more than just a wavelength dispersive spectrometer, it's a unique combination of possibilities that puts it in a class of its own with respect to analytical power, speed and task flexibility. Furthermore we have encapsulated application expertise in the form of turn-key solutions in the various Industry editions of the Zetium. This way PANalytical aims to continue its long history of market leadership in this instrument segment.

Can you enlighten our readers of the meaning of Zetium?
Believe it or not, naming a system is one of the most difficult tasks. We derived the name from the Greek word 'ζητω' (zētō), which means to search or inquire, and the common ending to many chemical element names '-ium'. Hence, Zetium, a powerful new element giving insight into our customers' materials.

Not all of our customers might be familiar with the stages of developing such a brand-new machine. What people were involved and how long has this process taken?
Developing an instrument that needs to operate in customer process-critical environments is a huge task. The first people involved are our customers who give us valuable feedback on our products and services and how we can improve them.
But when the project kicks into gear literally all departments within the company are involved in some way or another. An instrument like the Zetium is years in the making: from the research and conceptual design phase to the development and elaboration of the hardware and software, the quality testing, production of documentation, training our production and service engineers and even designing the crate the system is shipped in.

In fact it's dangerous to start listing all the departments involved in case I miss one – everyone is important!

Have all PANalytical employees already been introduced to Zetium?
Introducing a new system to our employees, especially the sales and service teams, is a very important aspect of the overall product introduction. As the interface to the customer, the sales engineers have to be confident and knowledgeable about our systems and services.

Zetium was the top billing at our 'insight' sales and service meeting during the first week of March. This *INSIGHT WEEK*, hosted in Almelo at our company headquarters, started with a show attended by over 500 employees with a finale featuring the unveiling of the new Zetium spectrometer. It was an exciting event and video clips of it are available on YouTube.

This was followed by several days of intensive lectures and workshops on Zetium and other PANalytical products and was attended by sales engineers, application specialists and service personnel from all over the world. This highly successful event fostered close ties within the PANalytical community.

"Zetium is more than just a wavelength dispersive spectrometer, it's a unique combination of possibilities that puts it in a class of its own with respect to analytical power, speed and task flexibility."
- Simon Milner,
product marketing manager X-ray fluorescence

Our theme is 'How to excel'; how and where can Zetium 'excel'?
Zetium is a platform concept with many performance-enhancing options that can be configured to match customer requirements. In its basic WDXRF form it is already a world-class product, but features like the EDXRF core give users the best of both techniques.

Zetium's THETA free lime concept is a first on sequential WDXRF spectrometers and gives a highly robust, repeatable and representative characterization of this important phase. Data accuracy has also been a key focus area for Zetium, with implementation of the latest data correction algorithms giving outstanding results.

Lastly, we wanted to enhance the user experience in setting up and operating the system and we have further developed our software Virtual Analyst™ to simplify the operation of such a multi-technology platform.

Could you give our readers a glimpse of other 'excelling' projects coming in 2015?
The applications we have highlighted with the combination of WDXRF and EDXRF are just the beginning. We will be busy examining a whole range of applications in the year to come and I expect that more applications will benefit from this breakthrough technology. I should also mention that there will be continuous improvements to the software, especially the 'brains' of the Virtual Analyst.

Simon Milner was born in England and studied Geology and Geochemistry to doctoral level. He gained his PhD at the University of Cape Town and worked for the Ministry of Mines and Energy in Namibia. As a geochemist, Simon gained experience in X-ray spectroscopy and was a PANalytical customer before joining the company in 2000.

Working as an application specialist and then a product manager, he is now group leader of the XRF Product Marketing team at PANalytical.
In his 15 years with the company, Simon has overseen the introduction of much of PANalytical's XRF product portfolio, for example the EDXRF Epsilon range and Zetium's predecessor, the Axios.

Zetium –
Elemental excellence!

PANalytical is delighted to announce the launch and introduction of the new Zetium X-ray fluorescence (XRF) spectrometer. Committed to providing customers insight into their materials and processes, we strive to be at the forefront of benefit-driven innovation, giving our customers their own competitive edge. Zetium embodies a unique combination of innovative attributes, changing the way we think about X-ray analysis and leading the way to new and exciting possibilities.

The Zetium concept is illustrated by 'elemental' themes describing technology, innovation, intelligence and support, to reflect the principal demands of our customers, namely analytical performance, usability and sustainability. Moreover, Industry editions of the Zetium spectrometer, drive the product offering from application requirements of the user. This makes it easier to define a fit-for-purpose configuration, rather than trying to assess performance from long lists of technical, sometimes irrelevant, specifications. To further aid specification, specific packages related to speed & throughput, robustness, performance enhancement and flexibility are also available to match key requirements.

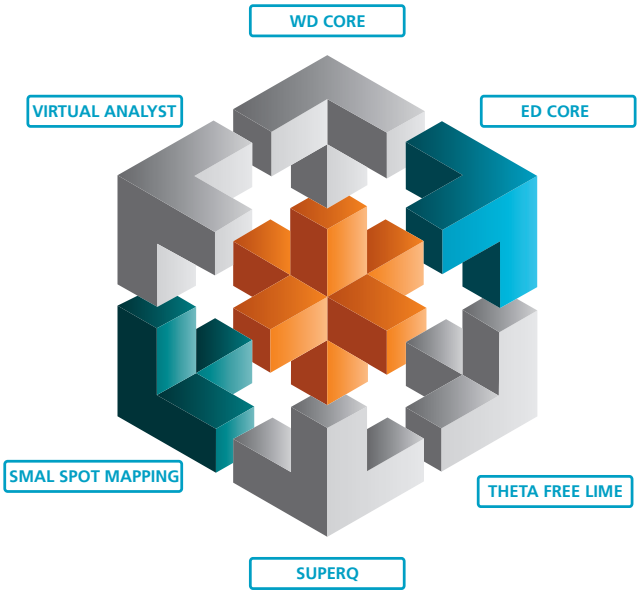
Zetium is the successor of our highly successful Axios range of spectrometers and this heritage of proven technology underpins the new analytical platform. The innovation at the heart of the Zetium platform is SumXcore technology, which is an integration of hardware and software for wavelength dispersive (WD) and energy dispersive (ED) XRF and mineral phase analysis.

A quantum step in our SuperQ software and the Virtual Analyst provide the system intelligence, giving enhanced data accuracy through new algorithms and access to the power of Zetium. The Virtual Analyst gives guidance and provides optimal setup of the multi-technology platform via a simple, intuitive, task-oriented user interface.

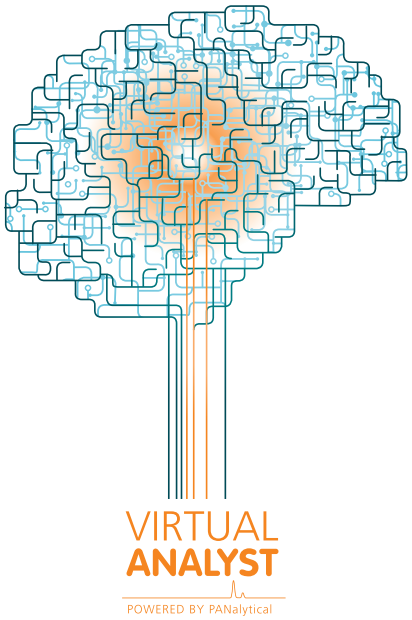
Lastly, users of Zetium are supported from every angle, from maintenance and repair services, to expertise, user training and accredited analytical services. With a worldwide network of experienced engineers, coupled with the industry's largest pool of application scientists, PANalytical is always at hand to help you meet your analytical requirements.

www.panalytical.com/zetium

Elemental **innovation**

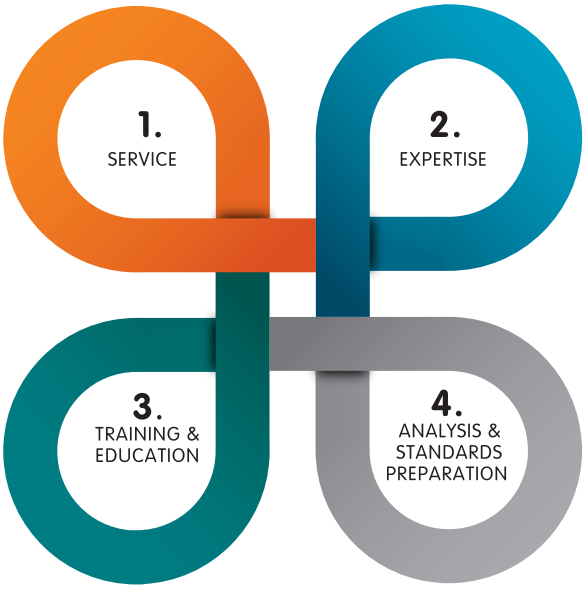


Elemental **intelligence**



Elemental **technology**

Elemental **support**



Zetium – A

Industry editions

Expertly chosen to fulfill the application needs of particular industries

Cement

Petro

Metals

Polymers

Minerals

Ultimate

Packaged solutions

The modular design allows customizable configurations to meet even the most demanding requirements, ensuring the best possible fit into your workflow.

Speed & throughput – for faster sample analysis

Robustness & uptime – for tough environments

Flexibility – to accommodate sample size and type variations

Performance enhancement – for superior sensitivity

An overview

SumXcore technology

An integration of wavelength dispersive (WD) and energy dispersive (ED) X-ray fluorescence with X-ray diffraction

- WD core
- ED core
- Virtual Analyst
- THETA free lime
- Small spot analysis and mapping
- SuperQ

Elemental support

Transparent and reliable

- **Service** – from a worldwide network of engineers and tailor-made support packages
- **Expertise** – from the industry's largest pool of application specialists
- **Training & education** – expert knowledge through courses, trainings, webinars and workshops
- **Analysis & standards preparation** – for compliance with the latest industry norms

SumXcore technology – new analytical possibilities

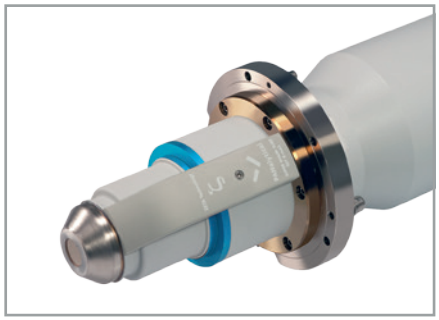
SumXcore technology is the software and hardware at the heart of Zetium, integrating the system's cores to deliver advanced performance coupled with maximum task flexibility. It brings exciting new possibilities to the workhorse spectrometer of many laboratories.

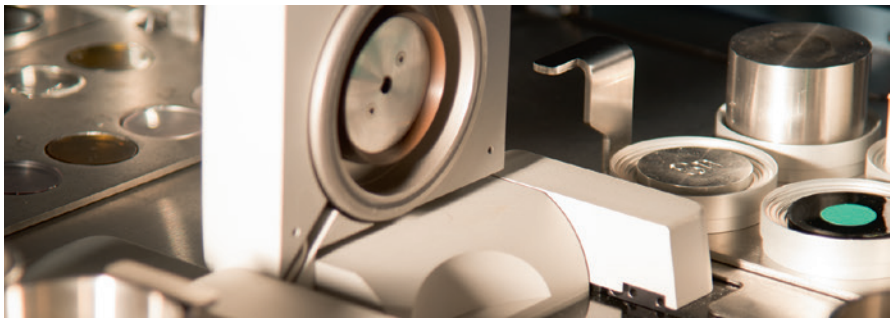
WD core

Inheriting proven technology from its predecessors, the Zetium spectrometer with its integral WD core continues the tradition of outstanding performance built up by the Axios.

We have focused on upgrading two points:
The sample changer is now 30 % faster than the previous instrument and allows the user to manually reposition the head to facilitate sample tray positioning.
The changer also supports five different sample layouts, depending on application and throughput requirements.

Building on a legacy of innovations (such as super-sharp, close-couple ceramic design, drift-free ZETA technology and CHI-BLUE corrosion protection) the new SST R-mAX tubes incorporate a patent-pending anode technology for advanced robustness and durability.

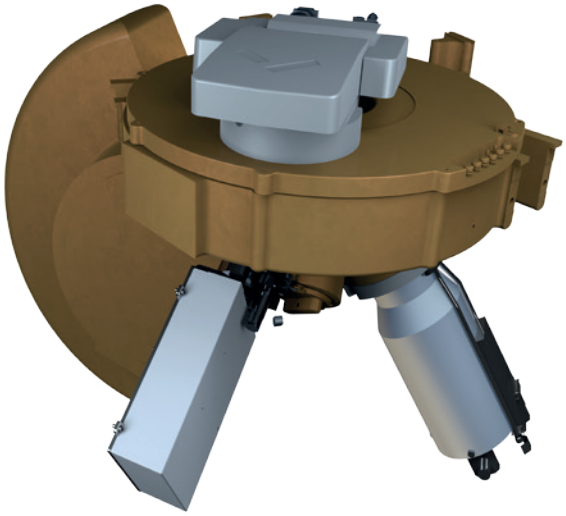




ED core

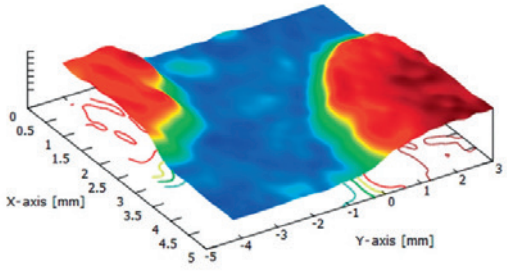
Maximum task flexibility and enhanced performance are available when WD and ED cores are used in parallel. Main benefits are either dramatically reduced measurement times (by up to 50%), or improved analytical precision.

The ED core has a high-resolution SDD detector, with variable signal attenuation for optimum performance flexibility. Capable of elemental analysis from Na – Am in concentrations from ppm – 100%, the ED core can also be used in parallel with the WD core to track unexpected elements that can adversely affect the accurate determination of critical elements in process samples. SumXcore technology can also enhance your QA/QC program and increase confidence in quality with two independent results for every measurement.



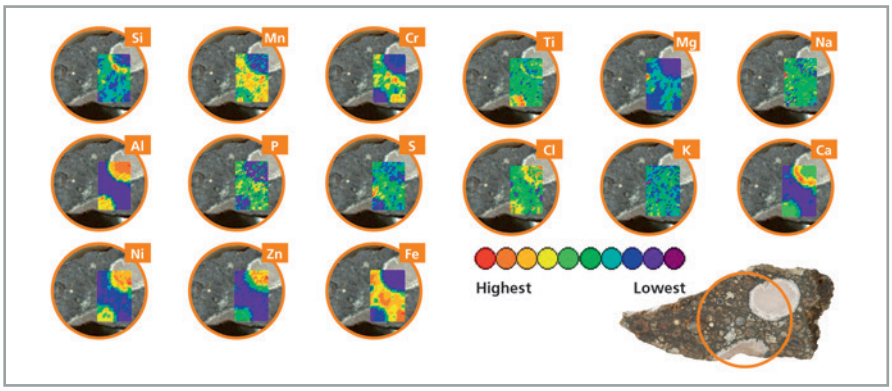
Small spot analysis and mapping

Small spot analysis with element distribution mapping is an ideal tool for materials research and production process troubleshooting. It makes a valuable addition to a bulk sample analysis spectrometer.



Mapping data for element 'Al' in a meteor

Use of the ED core, with fast simultaneous multi-element analysis per spot and a high-sensitivity, close-coupled optical path, leads to practical analysis times. Qualitative (intensity-based) or quantitative (concentration-based) applications can be set up, and the multi-element acquisition mode of the ED core makes Omnian applications possible, with all the usual advantages of standardless analysis.



THETA free lime core

Free lime quantification in cement clinkers is important for the optimization of energy consumption in the cement plant and for the quality of the end product.

The Cement edition of Zetium, incorporating the THETA free lime core, is the first sequential WDXRF system capable of free lime determination. This is important for users who prefer to maintain the flexibility and superior accuracy afforded by sequential systems compared to static simultaneous instruments.

The THETA core analyzes a very much larger volume of sample than traditional X-ray techniques making the method relatively insensitive to surface lime hydration and ensuring a representative analysis of the sample.

SuperQ 6 and **Virtual Analyst**

SuperQ 6 and the Virtual Analyst give direct access to the power and flexibility of Zetium, with seamless integration of the SumXcore technology in one software platform.

SuperQ 6 is simple and intuitive, with a stepwise, task-oriented flow. The Virtual Analyst provides expert guidance and calculates the optimal setup of the Zetium system, based on analytical requirements, such as total measurement time, precision or detection limits.

SuperQ 6 is augmented by a number of software modules, designed for specific applications, for example, Pro-Trace, Oil-Trace, Stratos and Omnian. In addition, we have implemented advanced matrix correction refinements for increased data accuracy from metals to polymers.

Excellent electrodes for the aluminium industry

R&D Carbon (RDC) emerged in 1986 from Alusuisse (now Rio Tinto Alcan), when founder Werner K. Fischer took over their carbon materials research department. He was convinced that the aluminium industry would profit enormously from a better understanding of how anode and cathode quality depends on the properties of raw materials and on process parameters. Over the last 25 years R&D Carbon has established its reputation for being the expert of choice when dealing with properties and behavior of carbon electrodes and materials.

Composition and geometry of carbon anodes strongly influence the energy consumption during electrolysis and are thus of utmost importance for a cost-effective process. This is where R&D Carbon's expertise plays a crucial role. Besides know-how and advice on all aspects of anode production, the company provides also equipment and services for testing and analyzing the stages in the life of a carbon electrode. Whenever there is a quality problem, RDC can provide help: from compositional analysis of the source material to the measurement of crystallite size in the finished anode.

PANalytical equipment is one of RDC's assets for these analyses. Together with RDC's calibration standards, the Axios^{mAX} X-ray fluorescence spectrometer provides accurate and precise compositional analysis of source materials (petroleum coke, coal tar pitch ...) and of the final electrodes. Any impurities causing problems can easily be identified. PANalytical's Empyrean X-ray diffractometer, on the other hand, serves to determine the size and arrangement of crystallites within the carbon. This microstructure determines the degree of heat treatment of the carbon and strongly influences its reactivity to air and CO_2, as well as its electrical and mechanical properties.

In addition to its technical services, RDC has its own R&D department where intensive research in carbon electrode technology is performed. Their know-how is then deployed by training and workshops worldwide. This way RDC's aim of improving electrode quality, hence reducing metal production costs and lowering capital investment for production plants is increasingly realized.

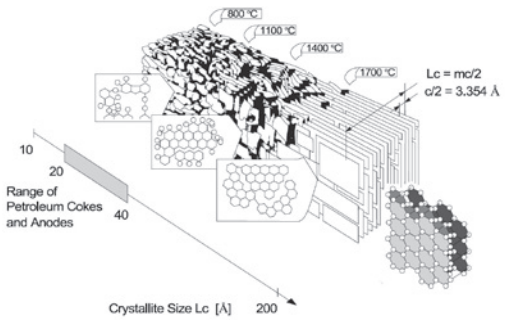
R&D carbon calibration standards and the laboratory

Aluminium production and carbon

Carbon anodes are essential for the production of aluminium. In this energy-intensive process a molten mixture of alumina (Al_2O_3), aluminium fluoride (AlF_3) and cryolite (Na_3AlF_6) is electrolyzed at 950 °C, yielding the elemental metal and oxygen. The carbon anode is gradually consumed by the subsequent reaction with the oxygen forming carbon dioxide gas.

The worldwide aluminium production is about 50 million tons, consuming 30 million tons of carbon anodes.

Sources for carbon anodes are coke (from crude oil), pitch (from coal) and recuperated anode butts . All raw materials are individually prepared to form the green anodes that are eventually baked at 1100 – 1200 °C.



Relationship between crystallographic structure and temperature: Crystallite size Lc increases with temperature and time.

R&D Carbon

R&D Carbon is the world-leading supplier of know-how in the field of carbon electrodes. With headquarters in Sierre, Switzerland it serves the aluminium, petroleum refineries, coal tar distillers and hence the electrode industries worldwide.

Twenty engineers and skilled technical staff provide solid support to the company's constant quest to improve product quality. R&D Carbon contributes substantially to reducing metal production costs and to lowering capital investment for production plants.

"The PANalytical equipment superbly complements our range of testing equipment for carbon electrodes and enables ever better analyses and process control."

- Jean Claude Fischer, director R&D Carbon

CubiX³ Iron – Strengthen your iron quality!

A few years ago, HKM (Hüttenwerke Krupp Mannesmann GmbH), one of the biggest German steelwork companies located in the heart of Germany's steelmaking Ruhr region, pioneered the use of advanced X-ray diffraction (XRD) methods in the steel industry by installing a PANalytical CubiX³ industrial diffractometer (see XPress 2/2013). Since then the demand for XRD applications in iron and steel production has increased considerably.

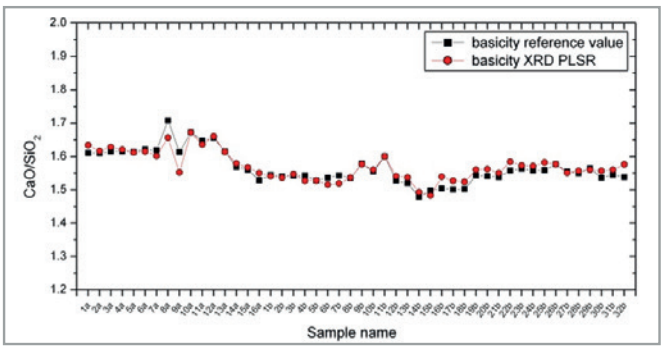
Originally sinter plants just wanted to replace their expensive wet-chemical methods for the simple quantification of Fe^{2+} by XRD. This analysis is required to reduce the coke consumption of the sinter plant.

Nowadays, however, to better steer the sinter process, the iron sinter community has embraced the advantage of knowing the total phase composition of the mixture. The same holds for other applications in the steel producing sector like the production of direct reduced iron (DRI) or the analysis of raw iron ore or raw materials.

That's why a number of steel producing companies worldwide have now started to implement industrial X-ray diffractometers in their production processes. The aim is not only to produce sinter with better quality but also to increase the efficiency of the sinter process by lowering the coke consumption.

For these projects PANalytical has developed a dedicated automated solution incorporating hardware, software and expertise. The proven CubiX³ Iron industrial diffractometer is specially configured to the needs of iron and steel producers dealing with iron ore, iron ore sinter, direct reduced iron (DRI), raw mixtures and steel samples (retained austenite analysis).

The newest version of PANalytical's HighScore Plus software package easily relates relevant process parameters such as FeO, Fe^{2+}, Fe^{2+}/Fe^{3+} and basicity (CaO/SiO_2 ratio) directly to the raw XRD pattern by employing partial least squares regression (PLSR), a powerful statistical method.

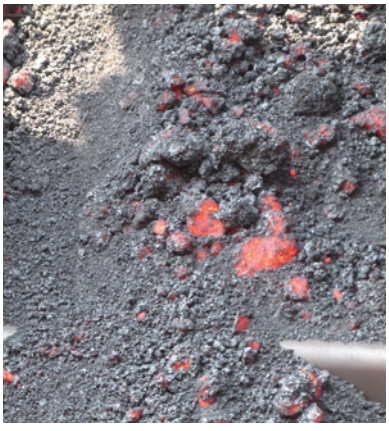


Comparison of the basicity of 48 sinter samples determined with XRD methods (red) and wet chemistry (black)

"In modern steel production plants time-consuming wet-chemical analysis methods belong to the past. An X-ray diffraction analysis can be done in less than 10 minutes."

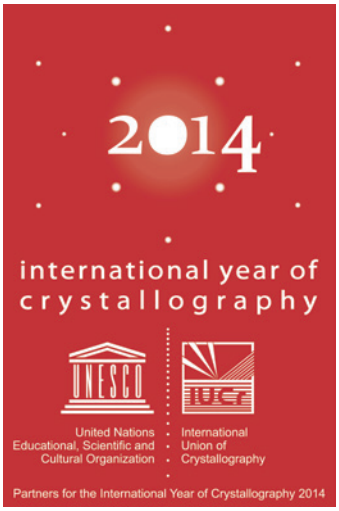
- Dr. Uwe König, Product Marketing XRD

Sinter is produced from fine ores, coke, recycled materials and fluxes like limestone or olivine. The sinter process takes place on a sinter strand where the mix is piled in a layer of 500-600 mm of height. The top of the layer is heated to more than 1350°C and ignited.



Farewell to an **excellent year**

The opening ceremony of the United Nations International Year of Crystallography (IYCr2014) in January 2014 was the start of an exciting year where UNESCO and International Union of Crystallography (IUCr) joined their efforts to promote crystallography worldwide. Whilst UNESCO has moved on to designate 2015 as the International Year of Light, the IUCr is now building on the contacts and activities created in IYCr2014.



Despite having many important applications in industries as diverse as agrifood, pharmaceuticals, aeronautics, new materials or mining, crystallography tends to be relatively unknown to the general public. IYCr2014 was aimed at increasing public awareness, inspiring young people, fostering international collaborations and promoting education and research in crystallography.

Because PANalytical has a long tradition in crystallography, our involvement and support was a natural consequence. At the inaugural ceremony and starting the year for us, PANalytical's XRD product manager, Martijn Fransen, gave a presentation about the importance of crystallography in our daily lives, available on www.panalytical.com/knowledgecenter. This presentation will fascinate you with the simple and clear examples of the crystallographic applications described.

During 2014 PANalytical organized a number of events, including workshops in Colombia, India and Brazil and OpenLabs in Ghana, Mexico and Turkey (in January 2015). Altogether, several hundred participants benefited from these introductions to the exciting science of crystallography.

PANalytical was pleased to organize a one-day satellite meeting on the HighScore Plus powder diffraction software during the IUCr general assembly in August 2014 in Montreal, Canada,. Many thanks to all our tutors, agents and colleagues who helped us to spread the spirit of crystallography!

The large amount of exciting 2014 events has not failed to create numerous contacts and initiatives with which the IUCr is now proceeding. More details of their plan of activities for the global crystallographic community in 2015 can be found at www.iycr2014.org/legacy.

OpenLab Mexico (18 - 21 November 2014)

OpenLab Turkey (19 - 22 January 2015)

PANALYTICAL ON THE ROAD

Towards excellent **PDF analysis**

In November 2014 the Spanish synchrotron ALBA (Barcelona) hosted the 'Hands-on course on the Pair Distribution Function method', organized by the staff of the powder diffraction beam line (MSPD). The course was intended for beginners in the field of pair distribution function analysis (PDF). Emphasis was on instrumentation at large-scale facilities and laboratory systems as well as on practical exercises with the most popular software packages available for PDF data analysis

The 33 participants from all over Europe enjoyed tutorials dealing with PDFgetx3 (the most recent software for PDF generation) on data generated with the MSPD beam line, and with PDFgui (for fitting PDF simulations).

PANalytical's application specialist Marco Sommariva presented a talk about PDF possibilities on PANalytical's laboratory diffractometers. Especially measuring reliable PDF data under non-ambient conditions raised a lot of interest as this has so far only been available at large-scale facilities.

The audience was also impressed by the excellent performances of the new PANalytical GaliPIX^{3D} detector (see also X'Press 3/2014), optimized for silver and molybdenum wavelengths. A striking example was for nanometric $ZnAl_2O_4$ where results derived from three different data sets (two from synchrotron beam lines and one from a PANalytical Empyrean equipped with GaliPIX^{3D}) were all consistent and very similar to each other.

This work, resulting from the collaboration with Milano University (Italy) and the ESRF in Grenoble (France), is described in detail in a recent publication.[1]

Reference

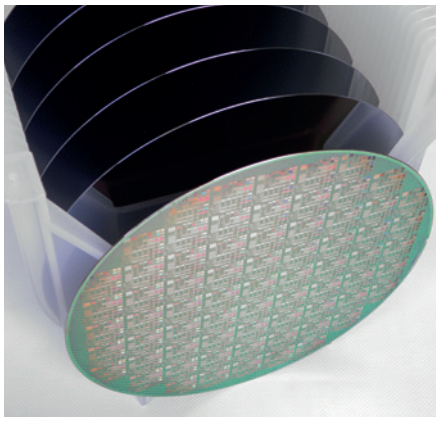
[1] A comparison of total scattering data from various sources: the case of a nanometric spinel, G. Confalonieri, M. Dapiaggi, M. Sommariva, M. Gateshki, A.N. Fitch & A. Bernasconi, accepted for publication in Powder Diffraction Journal (Oct. 2014)

Hands-on software demo with Q&A in Sweden

Since high-resolution X-ray scattering methods have become well established as the crystal growers' toolkit for epitaxial semiconductors, training for young scientists and refresher courses for more established scientists are much in demand.

PANalytical will host a refresher on the analysis of semiconductor structures by X-ray scattering methods on 10 -11 June, immediately following the EWMOVPE meeting (7-10 June 2015) in Lund, Sweden.

The course will cover data analysis using PANalytical's Epitaxy and Reflectivity software and best practice for alignment and measurement of X-ray diffraction and reflectometry.
www.panalytical.com/events



Events calendar 2015

The list shows a selection of events during the year where you will find us presenting the new Zetium spectrometer.

31 March - 2 April	Forum Labo	Paris, France
24 April - 1 May	IEEE	Toronto, Canada
11 - 15 May	Exponor	Antofagasta, Chile
19 - 12 May	CETAS	Düsseldorf, Germany
15 - 19 June	ACHEMA	Frankfurt, Germany
13 - 15 July	Iron Ore	Perth, Australia

www.panalytical.com/events

PANalytical **webinars**

2 April	Automation for analytical solutions in industrial environments
9 April	XRF technology improvements II
14 April	Elemental analysis of polymers
23 April	Polymers under mechanical stress: application of a tensile stage on a laboratory XRD system

www.panalytical.com/webinars

Building Materials Analysis Workshop

This acclaimed PANalytical workshop will be held this year on 14 – 17 June in Anaheim, CA, USA and will provide insight into the science of cement for industry and academic specialists.

Main topics are:
- New cements for sustainability and CO_2 reduction
- Cement analysis in production, sampling, sample preparation and characterization
- Quantitative analysis for process control of blended cements

www.panalytical.com/BMA2015

Colophon

Please send your contributions, suggestions and comments to the following address.

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