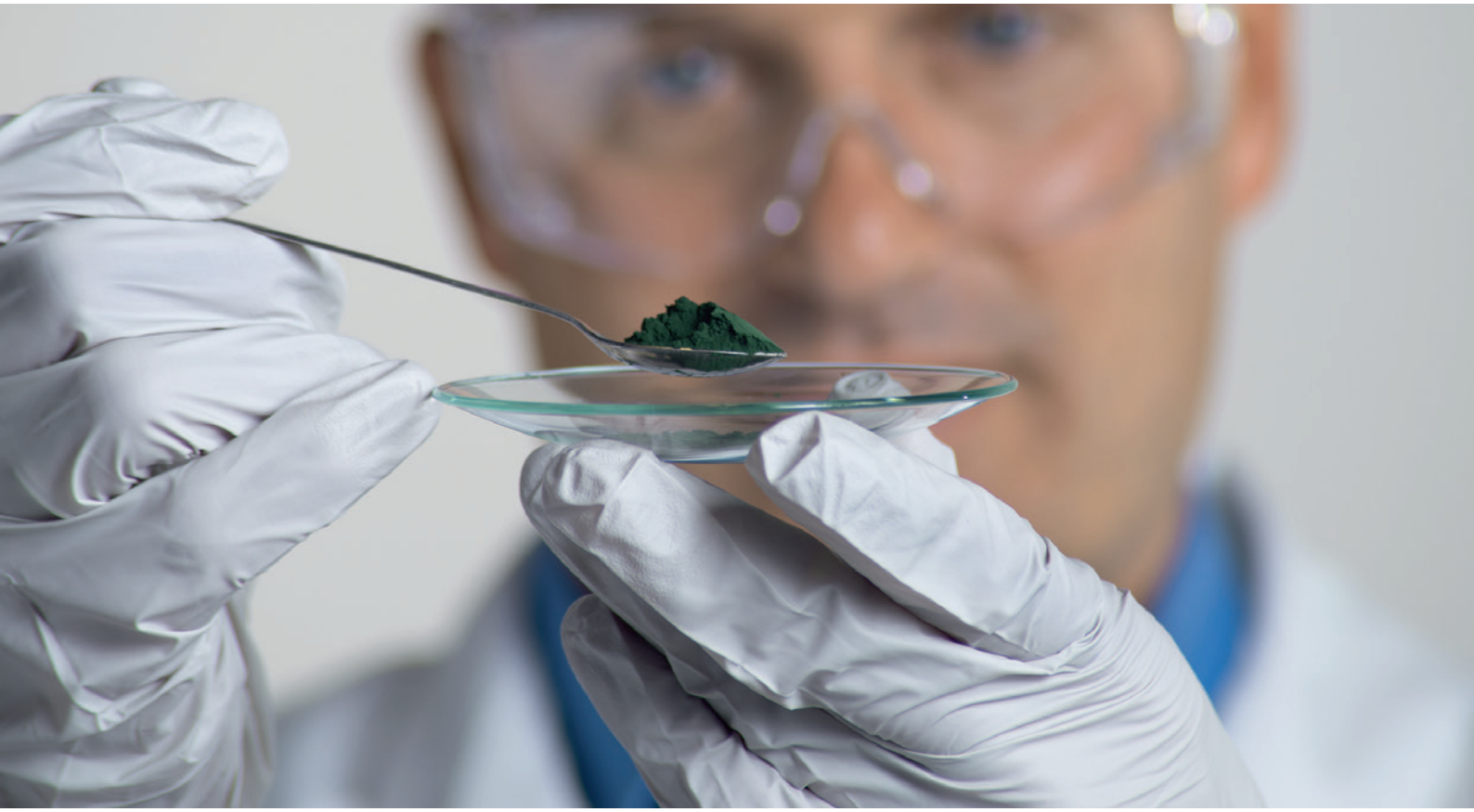
PANalytical
get insight



X'Pert^3 Powder

Dedication to X-ray powder diffraction

X-ray diffraction

Let materials work for you

Advancing materials research

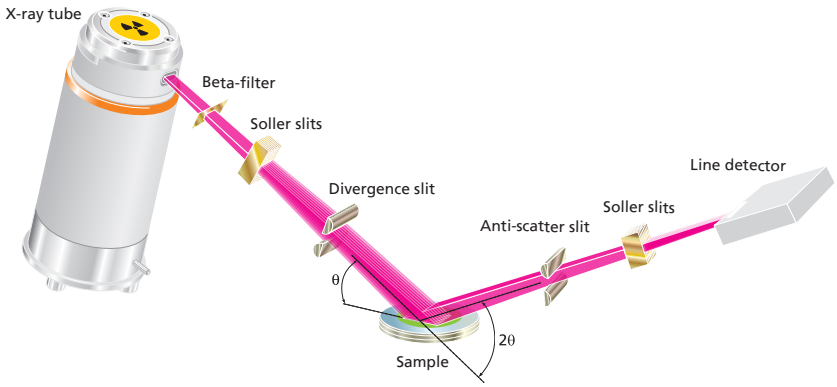
From geological exploration, through processing and on to the development of entirely new functions, materials must have the appropriate physical properties for effective exploitation.

The design and processing of materials require an efficient balance of useful properties such as strength, ductility, reactivity, corrosion resistance, ion mobility, heat resistance, and conductivity.

Investigating structural properties

Many physical properties are dependent upon the crystalline phases of the material. Structure-property relationships require an investigation of the chemistry, sizes and distributions of the phases. Establishing how the phases alter during processing and use is necessary at all stages of materials design.

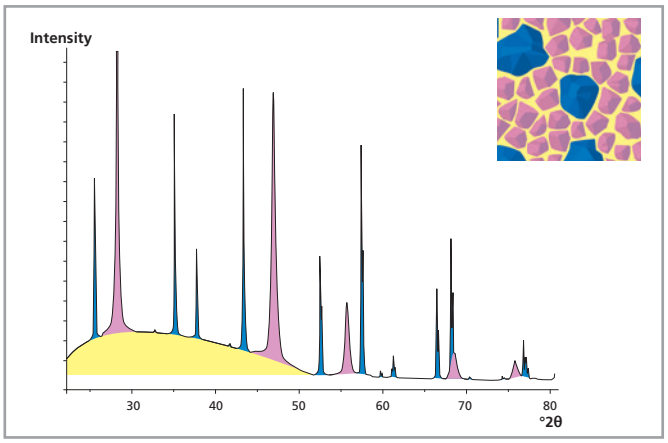
X-ray diffraction will give you the **answer**!



X-ray powder diffraction directly probes the crystallographic structure of the material and the changes of this structure.

A powder diffraction measurement yields a diffractogram, showing crystalline phases present (peak position), phase concentrations (peak areas), amorphous content (background hump) and crystalline size/ strain (peak widths).

X-ray diffraction can also yield information on nanoscale particles, disorded materials and thin films.



X'Pert³ Powder

The proven multipurpose X-ray diffraction platform

PROVEN

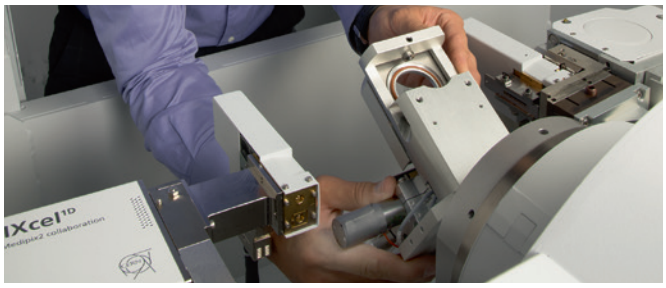
With a history of almost 20 years, over 2500 user sites and year-on-year improvements, the X'Pert platform has become the world's most popular and reliable X-ray powder diffraction instrument. With many innovations adopted from the high-end Empyrean platform, the X'Pert^3 Powder is ready for the future.

RELIABLE

X'Pert customers have been using their systems for many years (often even 24/7), praising its reliability, robustness and low running cost. With CRISP* technology, the X'Pert^3 Powder is taken to a new level of performance and longevity.

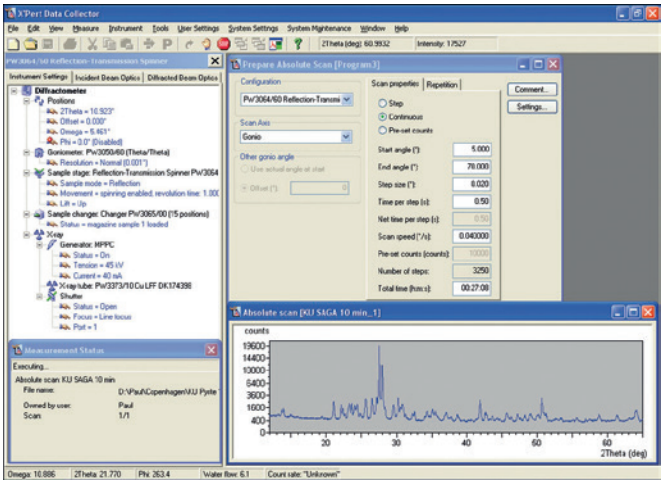
EASY EXTENSION

Research programs change and materials projects follow new directions. With PreFIX technology, the X'Pert^3 system can easily be upgraded as new applications arise or when new optics are available. The different optical configurations show no compromise in resolution or intensity when switching between applications.



EASY TO USE

The X'Pert^3 Powder excels in user-friendliness, with a consistent way of working regardless of the application. A complete data acquisition and analysis software suite help new users to intuitively learn the method and generate good-quality results right from the start.



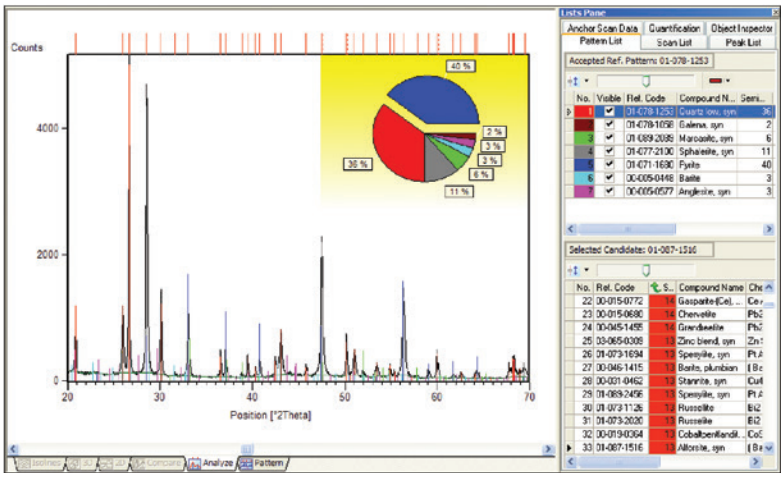
* *CRISP stands for corrosion resistant incident smart beam path. CRISP is a patented technology and prevents corrosion in the incident beam path caused by X-ray induced ionized air.*

Applications

Dedication to powder diffraction

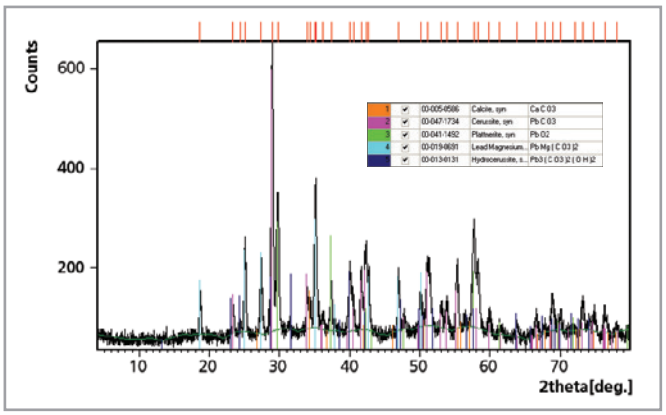
Phase identification and quantification of powders

X-ray diffraction scans of powders can be analyzed using Highscore (Plus) software. Different crystallographic phases can be identified and quantified and crystallite size and strain can be analyzed. HighScore is compatible with a number of reference databases including ICDD, PAN-ICSD and open source databases such as the Crystallography Open Database. This enables access to 100,000 – 500,000 reference patterns.

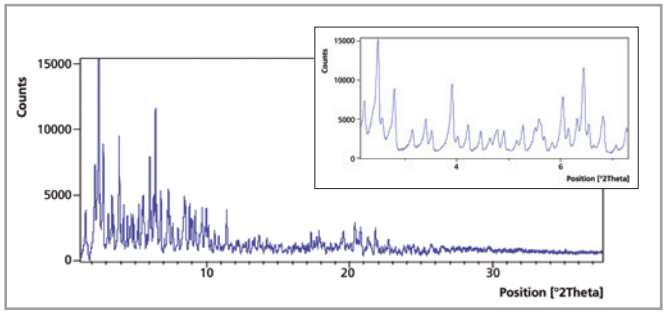


Microdiffraction on very small spots

For the investigation of small samples or small regions on larger samples various microdiffraction optics are available. As an example, a diffraction pattern of a paint flake is shown on the right.



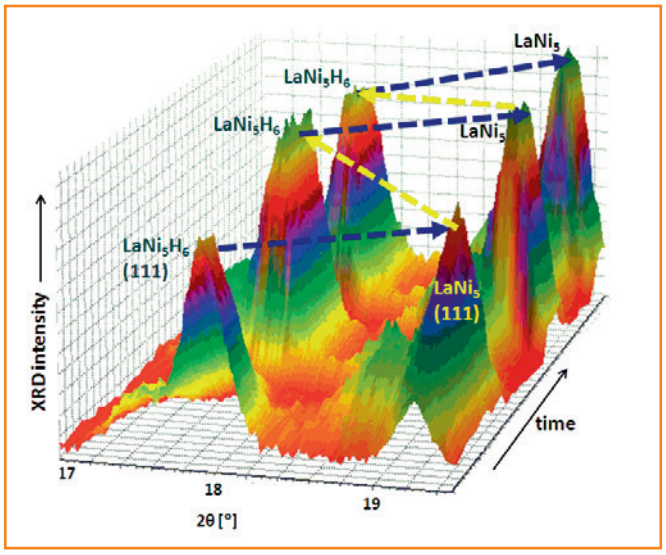
Transmission powder diffraction



Organic materials, such as pharmaceuticals, are typically transparent for X-rays and show peaks at low angles. For these materials the X'Pert^3 Powder diffractometer can easily be converted to transmission geometry setup for superior low-angle performance. The data set on the left was recorded on a crystallized lysozyme (a protein) in liquid, measured in a glass capillary.

In situ studies

In situ measurements are an invaluable tool both for the development of phase diagrams and the optimization of process parameters. The X'Pert^3 Powder diffractometer supports a number of sample stages enabling measurements at variable temperature, humidity, strain, pressure and more. Diffraction data showing the crystallographic changes of ammonia borane during the sorption of hydrogen at high pressures are shown on the right.

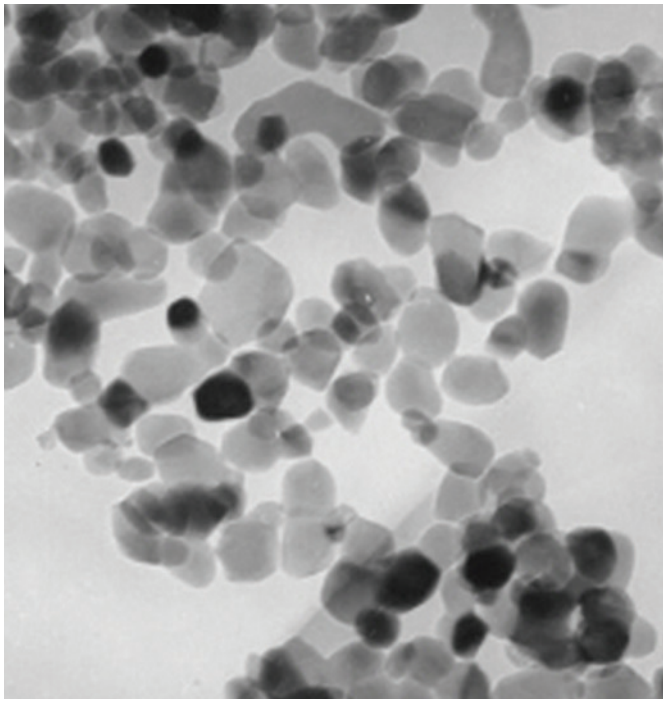


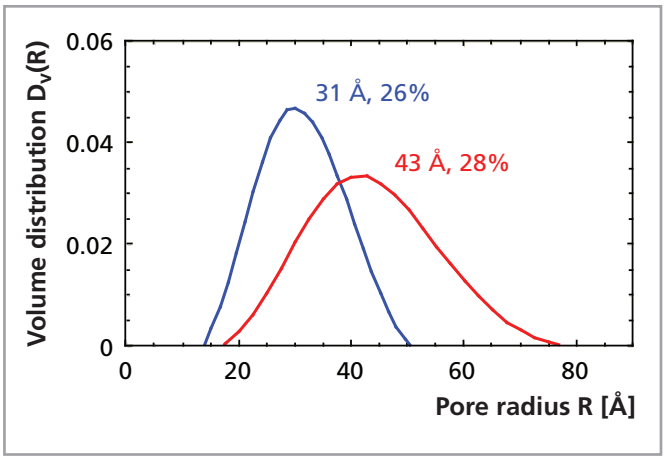
Nanomaterials

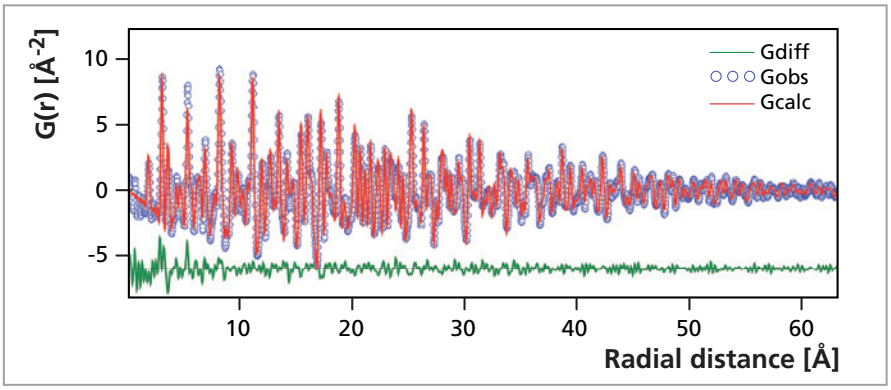
Characterizing structure at the nanoscale

Small-angle X-ray scattering (SAXS) is one of the most versatile techniques for the structural characterization of nanomaterials. Measurements are sensitive to the size and shape distributions of nanoscale particles. SAXS requires only minimal sample preparation.

SAXS measurements are made at very small angles using a transmission geometry which can be easily configured on the X'Pert³ Powder. The EasySAXS software contains a complete toolbox for SAXS data analysis and options for automation and reporting.





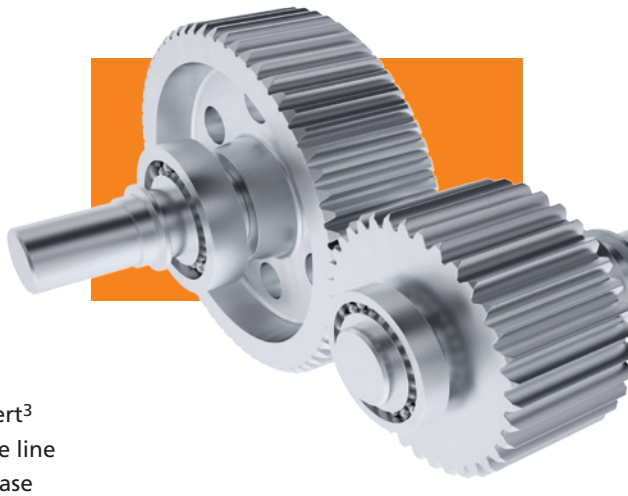


Many complex materials, including nanomaterials, contain amorphous and disordered components. Pair distribution function (PDF) analysis is an analytical technique that can provide structural information from disordered materials.

Establishing leadership, PANalytical was the first to bring the PDF application from the synchrotron to the laboratory. X'Pert³ Powder can be easily configured for PDF analysis. Experimental data obtained with PANalytical systems allow for comparison with synchrotron results.

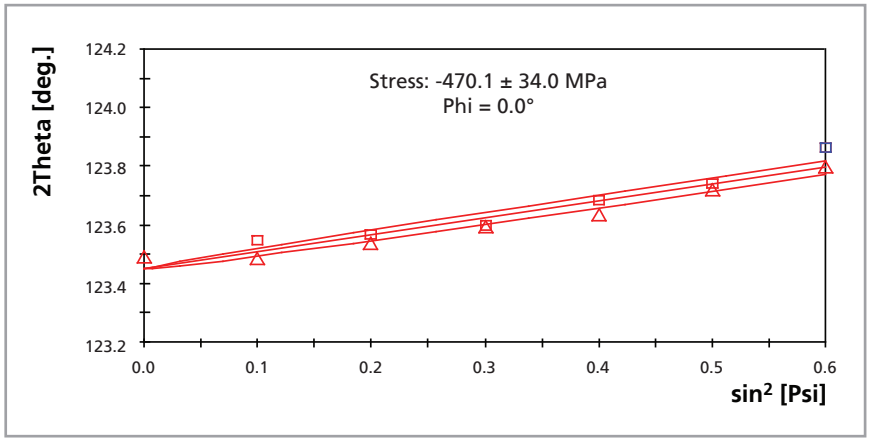
Solids

Your partner in component manufacture



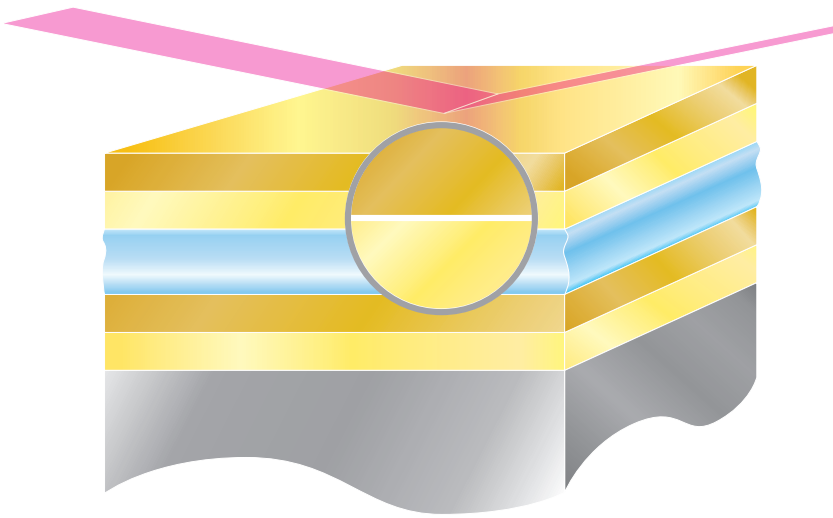
Important parameters for quality control during manufacturing processes are the total composition of phases in the material and the residual stresses. Because crystallographic structures act as an atomic-scale strain gauge, X-ray diffraction offers a fast and non-destructive measure of residual stresses in a metal or ceramic component.

Stress measurements with the X'Pert^3 Powder can be done with the same line focus configuration as used for phase analysis. An X-ray mirror can be used, which is beneficial when measuring curved samples. PANalytical Stress and Stress Plus software offer a powerful solution for stress and thin film stress analysis.



Thin films and coatings are an integral part of many components. X-ray reflectivity and glancing incidence phase ID are ideal methods to measure layer thickness and composition in thin films and multilayers.

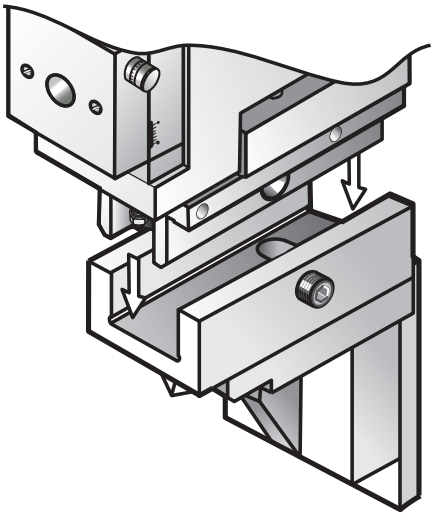
The X'Pert^3 powder is also suited for X-ray reflectometry and glancing incidence measurements. Together with the class-leading Reflectivity and Highscore (Plus) software from PANalytical, X'Pert^3 Powder offers powerful solutions for thin film analyses.



PANalytical

Your partner in leading technologies

PANalytical is present for application and service support in all but a few countries in the world, and has application laboratories in the Netherlands, the US, Brazil, China and Japan. PANalytical has been in the analytical X-ray business since the 1920's showing innovations not only in products and applications, but also in customer support and service. Let PANalytical be your partner every step of the way!

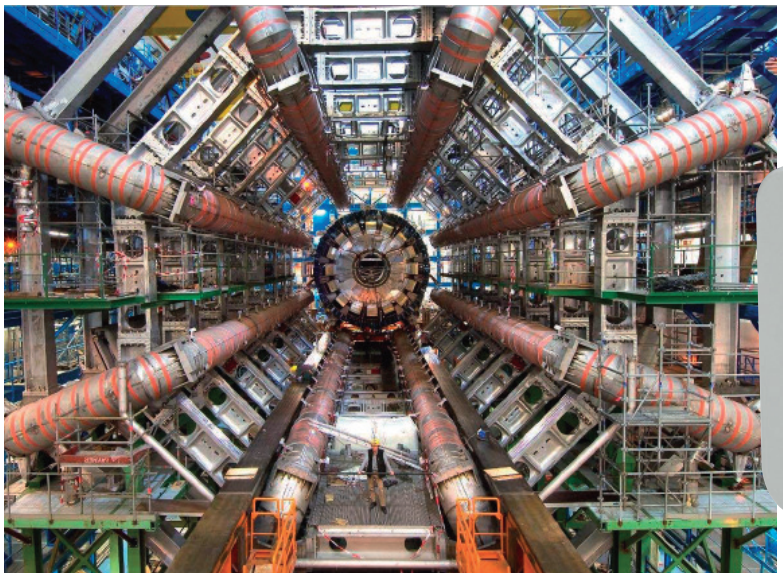


Leading with **PreFIX**

PANalytical's diffractometer, X'Pert MPD, was the world's first multipurpose XRD platform. With PreFIX technology on the X'Pert PRO, PANalytical pioneered the concept of fast interchange of optics, enabling modular systems to be built without the need for re-alignment.
Now X'Pert³ Powder benefits from the latest developments in PreFIX optics, sample stages, detectors, X-ray tubes and analysis software.

Leading in **detector development**

PANalytical collaborates with leading research institutes including CERN, establishing its leadership at the forefront of detector technology.



Active in XRPD since the 1920's

X-ray powder diffraction has become the standard for the identification and quantification of crystalline phases in polycrystalline solids and powders. The methods have been perfected over many decades in collaboration with leading organizations in this field, like the International Union of Crystallography and International Center of Diffraction Data. PANalytical is proud to be part of the global powder diffraction community since the 1920's.

Superior **application support**

PANalytical products are accompanied by extensive documentation to help you get the most out of your investment: user guides, quick start guides, software help function and tutorials. Written by in-house experts, PANalytical provides free information on its website www.panalytical.com.

Courses

PANalytical offers onsite training and customer courses around the globe. Courses on basic XRD, crystallography, *in situ* measurements, HighScore and small-angle X-ray scattering are just a few examples. See www.panalytical.com/courses for more details.

PANalytical
get insight

About PANalytical

PANalytical's mission is to enable people to get valuable insight into their materials and processes. Our customers can be found in virtually every industry segment, from building materials to pharmaceuticals and from metals and mining to nanomaterials. The combination of our software and instrumentation, based on X-ray diffraction (XRD), X-ray fluorescence (XRF) and near-infrared (NIR) spectroscopy as well as pulsed fast thermal neutron activation (PFTNA), provides our customers with highly reliable and robust elemental and structural information on their materials and is applied in scientific research and industrial process and quality control.

PANalytical employs over 1,000 people worldwide. The company's headquarters are in Almelo, the Netherlands. Fully equipped application laboratories are established in Japan, China, the US, Brazil, and the Netherlands. Supply and competence centers are located on two sites in the Netherlands: Almelo (X-ray instruments) and Eindhoven (X-ray tubes), in Nottingham, UK (XRF applications and standards), in Quebec, Canada (fusion sample preparation) and in Boulder CO, US (near-infrared instruments). A dedicated research activity is located on the campus of the University of Sussex in Brighton (UK).

PANalytical is active in all but a few countries of the world with a worldwide sales and service network that ensures unrivalled levels of customer support.

The company is certified in accordance with ISO 9001 and ISO 14001.

Visit www.panalytical.com for more information about our activities.

PANalytical is part of Spectris plc, the productivity-enhancing instrumentation and controls company.

Access to expertise

With the largest service network we are able to offer the most comprehensive support package possible.

Expertise:

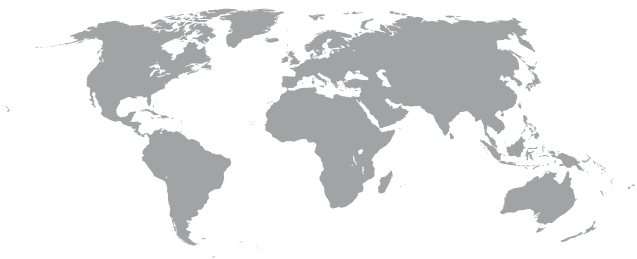
- On-site training available
- Training courses
- Performance optimization
- Customizable expertise programs
- Assistance with multi-laboratory standardization

Care Agreements

Our customer support solutions have been developed with your business in mind. They are formulated as a family of four Care Agreements which can be tailored to your specific needs and provide fast, secure and reliable support.

- **ECONOMY: indispensable coverage for self-sufficient operations**
- **ADVANCED: cost-effective support for routine usage**
- **PREMIUM: flexible package for high equipment usage**
- **ELITE: most comprehensive package for demanding environments**

Global and near



PANalytical B.V.
Lelyweg 1, 7602 EA Almelo
P.O. Box 13, 7600 AA Almelo
The Netherlands

T +31 546 534 444
F +31 546 534 598

info@panalytical.com
www.panalytical.com

Regional sales offices
Americas
T +1 508 647 1100
F +1 508 647 1115

Europe, Middle East, Africa
T +31 546 834 444
F +31 546 834 969

Asia Pacific
T +65 6741 2868
F +65 6741 2166

www.panalytical.com/xpert3powder