Brighten Up Your Lab: Upgrading Home-Lab X-ray Diffractometers with Incoatec´s Unique Microfocus Source

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Upgrading Existing Diffractometers with IμS

Incoatec offers a unique possibility to improve the performance of your existing diffractometer by installing our high-performance, air-cooled and low-maintenance microfocus source IμS.

You have a Bruker AXS, Marresearch, Nonius, Rigaku, Huber or some other system?

Brighten it up with Incoatec´s state-of-the-art microfocus X-ray source IμS!
A significant increase in flux density of more than $2 \cdot 10^{10}$ ph/(s·mm²) and beam cross-sections in the range of 100 μm can be obtained. With an IμS upgrade you will get the highest standard of quality, precision and safety Made in Germany. Our long-standing experience is based on more than 80 upgrades worldwide with IμS integrations into most of the existing X-ray diffractometer types. Your local service contact can be involved in the on-site installation. Even more, Incoatec provides profound customer support during the whole upgrade project and beyond. We take care!

Your upgrade options:

- Source, optics and beam conditioning elements
- Single source upgrade for XRD, SCD, (GI)SAXS, XRR and many more applications
- Dual wavelength setup by adding IμS as complementary source
- Cu, Mo, Ag, Co and Cr radiation (others on request)

Your benefits:

- No maintenance, only single phase power and no water cooling required
- 3 years warranty
- Maximum installation down time of only 2 - 4 days
- Stand-alone operation (remote control) or full implementation into Bruker software
- Full integration into existing safety circuits, new safety concept development on request
- Full compliance with European Machinery Directive 2006/42/EC

IμS 3.0 - The new Micorofocus X-ray Tube with *IXT*

The latest generation of the IμS, the air-cooled IμS 3.0 source, contains the new Incoatec X-ray Tube *IXT* and is the first microfocus X-ray source that is exclusively designed for X-ray diffraction. Numerous small improvements make the IμS 3.0 the most user-friendly, yet most powerful microfocus sealed tube X-ray source ever.

IμS 3.0

Incoatec Microfocus Source

30% more intensity

- new X-ray tube *IXT* designed by incoatec
- first microfocus source optimized for X-ray diffraction
- He filled optics housing and pre-aligned optics
- improved user-friendliness
- for Cu, Mo and Ag radiation
- 3 years warranty
- available in the new Bruker AXS solutions for crystallography - the D8 VENTURE Gen 2 and D8 QUEST Gen 2 - both in single and dual source configurations

IμS Upgrades on Bruker AXS Systems

Incoatec supports full integration into two decades of Bruker´s X-ray product portfolio with worldwide project experiences. This includes former Nonius diffractometers, all generations of Bruker D8 machines and the Bruker SAXS product lines. Close teamwork with the Bruker AXS system developers and local service staff ensures the highest standard of system integrity.

Nonius Kappa APEX II with FR 590 enclosure in Jena, Germany

Bruker APEX II DUO IμS in Düsseldorf, Germany

Bruker NANOSTAR (IμS and SCATEX upgrade) in Vienna, Austria

Bruker D8 DISCOVER GADDS in Karlsruhe, Germany

Mo-IμS for High Resolution Small Molecule Crystallography

Several data sets were measured on crystals of organic and inorganic compounds with the Mo-IμS and with a FR591 rotating anode generator (Mo anode, flat graphite monochromator), both attached to a Nonius Kappa CCD. The data clearly demonstrate the superior performance of the IμS on very small crystals for which an increase in intensity by a factor of about 3 was observed. For larger crystals, the performance is comparable to the 4 kW rotating anode generator.

Source	IμS	RAG	IμS	RAG
Sample	SiO_2		$C_4H_9O_6N$	
Size [mm³]	0.02 x 0.04 x 0.04		d = 0.18 (sphere)	
Power [kW]	0.03	4.0	0.02	4.0
Exposure time [s/°]	150	150	20	20
$\langle I \rangle^{\#}$	17.1	5.9	344.1	537.9
$\langle \sigma \rangle$	1.6	1.1	5.1	6.8
*R*1	0.084	0.090	0.036	0.041
*wR*2	0.240	0.241	0.082	0.082

Statistics for data sets recorded on a smaller quartz crystal and a larger crystal of ammonium-bitartrate (courtesy of C. W. Lehmann, MPI Muelheim).

IμS Upgrades on Other Systems

Incoatec has upgraded more than 30 other commercial X-ray diffractometers from all over the world. An audit of the existing radiation safety system according to your local safety demands with required upgrades is mandatory. Together with detailed experiences about third-party controller systems Incoatec offers an all-in-one diffractometer solution even with such non-Bruker machines.

Marresearch 345 dtb in Basel, Switzerland

Replacement of Rigaku RU-200 generator in Boulder, USA

STOE IPDS II in Mainz, Germany

Huber goniometer with APEX II detector in Newcastle, UK

Special Engineering

Cutting-edge research deserves state of the art technical support. An international team of engineers, physicists and chemists with a broad background in all kinds of scientific applications find the optimal solution also for your specific application. Contact us, challenge us.

XRD/XRR setup in synchrotron optics lab at ESRF in Grenoble, France

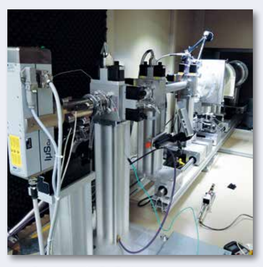
Surface and thin film XRD setup in Halle, Germany

Combined XRF/XRD setup for painting analysis in Antwerp, Belgium

SCD setup for time resolved experiments w/ XPAD detector in Nancy, France

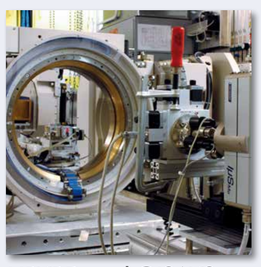
IμS and SCATEX upgrades on SAXS systems

The potential of the IμS for (GI)SAXS studies in the home-lab is demonstrated in an overview of representative experimental set-ups (below). The IμS can be used to achieve excellent results in the study of e.g. in-situ thin film deposition in UHV chambers by using GISAXS. The data quality can be further improved by combining the IμS with scatter-free SCATEX pinholes, which reduce the background by eliminating parasitic scattering that is observed with conventional metal apertures. SCATEX pinholes are made of single crystalline materials, such as Ge or Ta, and can be offered with a diameter in the range 2000 μm to 20 μm.



IμS and SCATEX upgrade on a customized SAXS setup in Hamburg

Huber system for SAXS in Tamkang, Taiwan

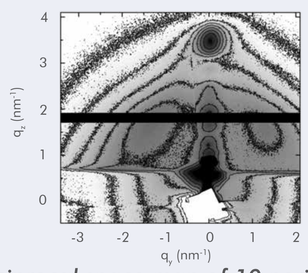


HRXRD and GISAXS setup at synchrotron beamline (Petra III, DESY) in Hamburg

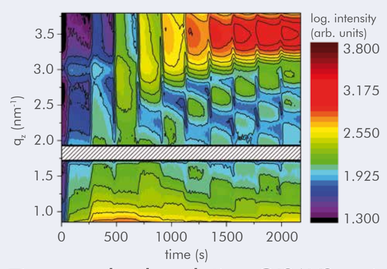
Adaptation to UHV deposition chamber for in-situ GISAXS studies in Bratislava, Slovakia

In-situ GISAXS during thin film growth

By using in-situ GISAXS in the home-lab the growth of multilayers was studied in-situ during thin film deposition. This kind of experiments is typically done at synchrotrons. With an IμS adaption to the UHV deposition chamber such cutting-edge research can now be done in the home-lab.



Reciprocal space map of 10 periods W/B_4C multilayer mirror with 1.5 nm period thickness measured in-situ by GISAXS in deposition chamber



Time resolved evolution GISAXS reciprocal space map of the 10x W/B_4C multilayer mirror with visible Bragg peak and Kiessig fringes

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