

The Incoatec Microfocus Source I μ S for XRD-Applications



The Incoatec Microfocus Source I μ S^{High Brilliance}



D8 Advance XRD² system with I μ S^{High Brilliance}



Bruker D8 DISCOVER with GADDS with I μ S

The I μ S^{High Brilliance}, the next generation of Microfocus Sources, includes the latest type of 2-dim beam shaping Montel multilayer mirrors and is available for Cu, Mo, Ag, Cr and Co radiation. When compared to the original I μ S the new I μ S^{High Brilliance} delivers an increase in intensity of about 30% for Cu, 50% for Ag and 60% for Mo due to an improved heat management. The I μ S^{High Brilliance} includes all the familiar advantages of the previous I μ S system: air-cooling, no moving parts and long lifetime without maintenance. It combines all advantages of a sealed-tube system with the superior data quality of conventional rotating anode systems. Furthermore, memory chips are integrated into the tube, the tube mount and optics, thus allowing the recording of the real-time status of the components. This simplifies considerably the installation and change of components and enables assessing the system online, making remote diagnostics faster, better and easier. The I μ S^{High Brilliance} is available as a component of diffractometers of Bruker AXS such as the new D8 DISCOVER or VENTURE or as an upgrade.

The Source

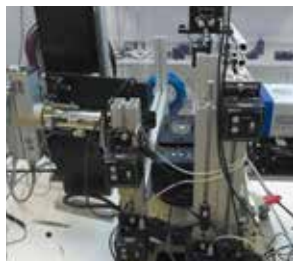
- air cooled
- Cu, Mo, Ag, Cr and Co available
- component recognition
- improved safety features
- fully compliant with Machinery Directive 2066/42/EC

Quazar Optics

- 2-dim beam shaping
- collimating or focussing
- patented housing for high stability and easy alignment
- motorized alignment (optional)

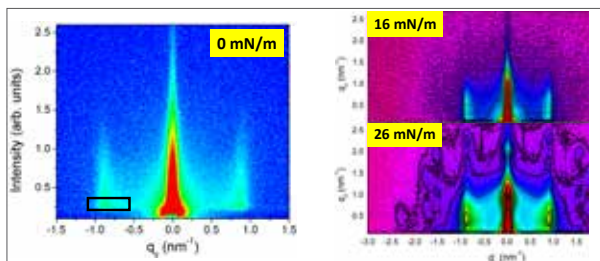
Small Angle X-ray Scattering

Silver particles on a Langmuir film were analyzed at different surface pressures which were applied by means of a reduction of the surface area. It was possible to study the transition process from unordered islands to ordered layers by increasing the pressure on the surface. (Data courtesy of P. Siffalovic, Academy of Science, Bratislava, Slovakia)



Combination of the I μ S with a Dectris Pilatus detector for rapid GISAXS measurements of liquid samples

Angle of incidence: 0.2deg
Measurement time: 180 sec
The surface was compressed with 0 up to 26 mN/m.

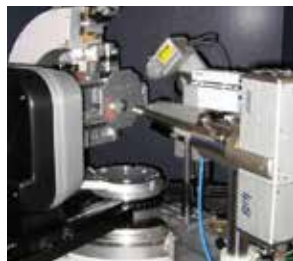


Unpressed surface: unorderd islands (left)
increased pressure: island coalescence (right, above)
vertical formation of hexagonal layers (right, below)

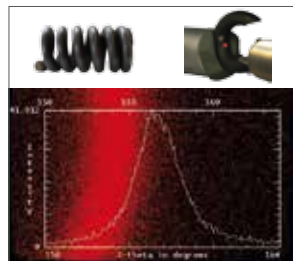
Stress Analysis

Mounting of a Cr-I μ S to a Bruker-GADDS system with VANTEC2000 detector allows fast measurements. With this setup stress measurements on a steel spring are possible. Each frame was recorded within 30 seconds.

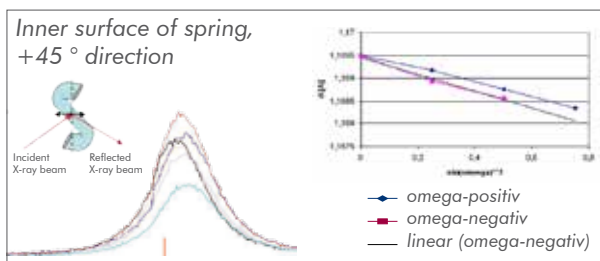
(Data courtesy of H. and U. Göbel, LabXA, Munich, Germany)



Setup with the Cr-I μ S



Diffraction pattern



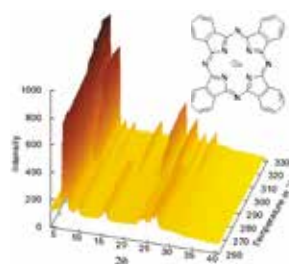
Result: compressive stress of -238 MPa

Temperature Resolved Studies

Fine grained copper phthalocyanine was fitted to a mar345dtb with Cu-I μ S and heated from 30 °C to 350 °C. The phase transition was monitored in situ. In comparison a second data set was recorded at the synchrotron ANKA (Karlsruhe, Germany).



Experimental set-up



Diffraction pattern and structure of copper phthalocyanine with the phase transition at approximately 300 °C measured with I μ S.

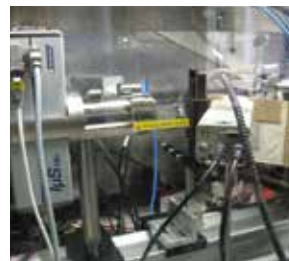
The results obtained with the lab instrument on reaction temperature (295°C) and activation energy (254±15 kJ·mol⁻¹) of the phase transition, are comparable to results of synchrotron data (300°C, 245±8 kJ·mol⁻¹).

(Data courtesy of R. Dinnebier, MPI, Stuttgart, Germany)

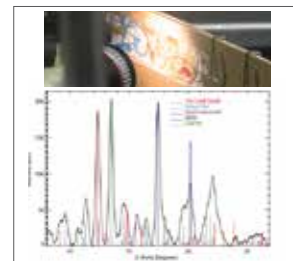
Scanning Microdiffraction

A painting in a medieval manuscript was investigated using a Mo-I μ S with focusing optics. Within 30 seconds exposure time frames were recorded using a Smart 1000 detector (Bruker AXS) to identify the color pigments.

(Data courtesy of F. Vanmeert and K. Janssens, University of Antwerp, Belgium)



Setup for the measurements in transmission geometry



Book painting (above) and diffraction pattern of green colored region (below)

With this setup it was possible to scan in an overnight measurement an area of several square millimeters with a resolution of 150 μ m. Such investigation allows statements on repairing, repainting or falsification of art objects. The light-weight and compact design of the I μ S gives the opportunity for a mobile setup for measurements outside of the home-lab.