

# S2 PICOFOX

● Spectrometry Solutions



## S2 PICOFOX – True Trace Analysis with XRF for the First Time!

**You need to know the concentration of trace elements in environmental samples?**

You only have the slightest amount of a biological sample available for analysis? No time for time-consuming sample preparation during industrial routine operation? The innovative S2 PICOFOX fits your needs perfectly.

The S2 PICOFOX uses the principles of X-ray Fluorescence (XRF) analysis for the testing of liquids, powders and solid samples. The spectrometer detects trace elements in liquids down to 0,1 ppb. And in contrast to most analytical methods, ng to µg sample amounts are sufficient for quantitative results.

**Is XRF a complicated element analysis method?**

Not at all! The compact S2 PICOFOX instrument design allows even mobile use for measurements on-site or in the field. First results are available within minutes.

The S2 PICOFOX works without expensive consumables, gases or liquid nitrogen. You can save your budget for the essentials – all the S2 PICOFOX needs is a power source.

## ● Advantages



- Detection limits down to 0.1 ppb
- Concentration range from ppb to 100 percent
- Analysis of the extremely small sample amounts
- Compact, portable design
- Simple quantification
- Only needs a power source – no expensive consumables

# Challenging Samples – No Worries with S2 PICOFOX

## Analysis of heavy metals in sewage samples.

International decrees strictly regulate the discharge of sewage. Testing for heavy metals in sewage by conventional methods, such as ICP, requires complete digestion of the sample using hazardous chemicals. This time-consuming and destructive sample preparation step can be omitted with the S2 PICOFOX. Untreated sewage can be diluted with a detergent solution (1:10) and measured immediately after the addition of an internal standard.

**Key elements (e.g. chromium, arsenic, lead) are detectable far below usual threshold values. The simple sample preparation leads to quick results and allows immediate, continuous monitoring of sewage treatment.**



## Investigation of metallo-proteins.

Quite often, only very limited sample amounts are available for elemental analysis in protein research. In order to understand of the biological function of a protein, its metal content must be carefully measured. While other analytical methods fail due to the small sample amount, a few microlitres are sufficient for the S2 PICOFOX.

**The stoichiometric relationship of metals in enzymes can be determined, resulting in the characterization of biological enzyme functions.**

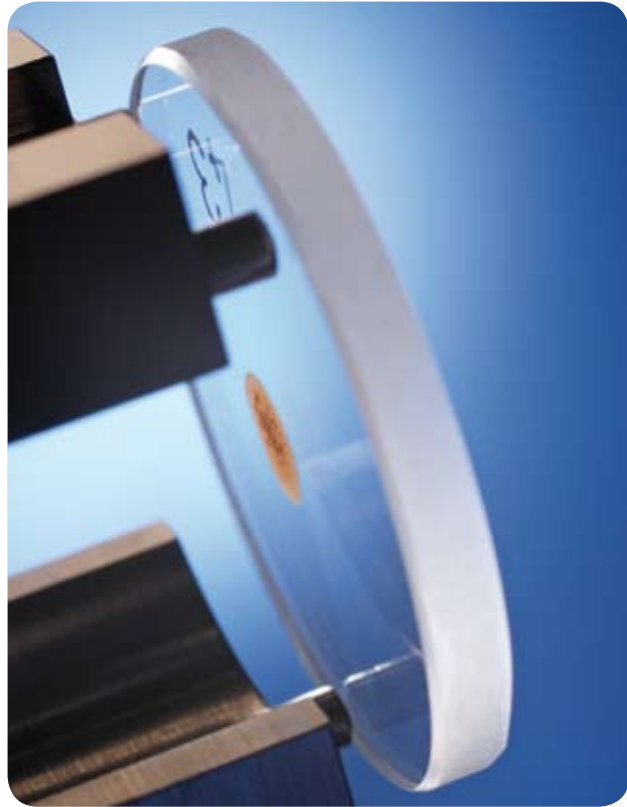


## ● Applications

### Authenticity tests of pharmaceutical samples.

The characterization of brand drugs and their generics is an essential task in pharmaceutical analysis. The analysis through methods like AAS or ICP-OES is often restricted by sample quantity, the necessity for sample digestion and matrix-related difficulties. Whereas TXRF/XRF allows for trace element distribution analysis of samples within the microgram range. As this method is based on internal standardization, no standards for external calibration are needed.

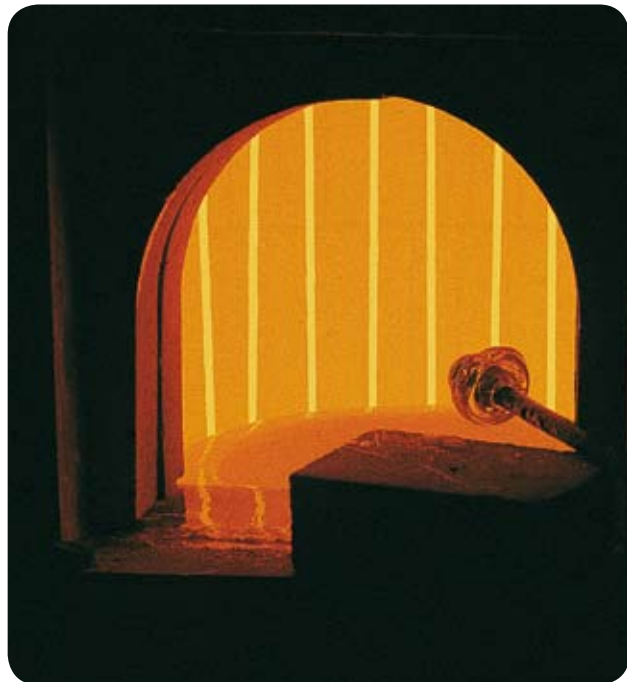
**A quantitative fingerprint analysis of various aspirin drugs lead to a clear identification of brand products.**



### Measurement of mercury in glass.

The quantitative measurement of the volatile element mercury is time-consuming and requires the handling of hazardous chemicals. Fast trace analysis without complicated sample preparation is possible when using the S2 PICOFOX. Glass samples can be simply ground and suspended in solution.

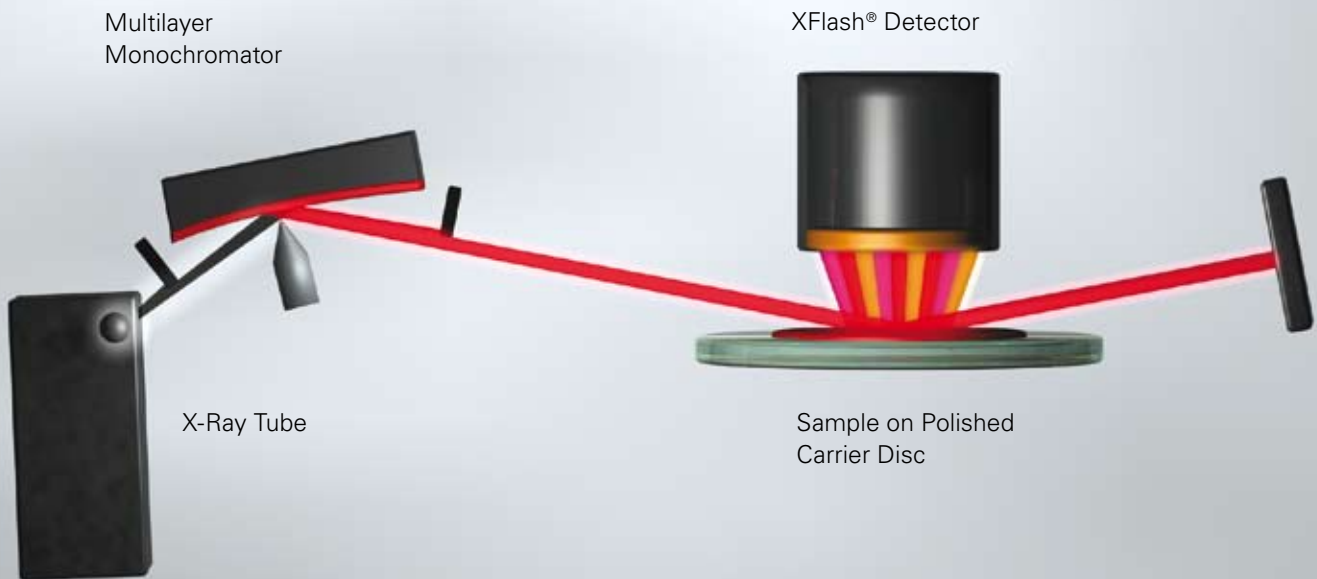
**XRF measurements with the S2 PICOFOX provide accurate, reliable results and demonstrate detection limits below 200 ppb for mercury in glass samples.**



- Trace elements in river, lake and sea water
- Toxicological analysis of blood and urine
- Monitoring of cancer medication in blood
- Quality control and origin analysis of wine
- Elemental composition of nano particles
- Fast wipe tests for contamination control

# Minimum Sample Preparation – Maximum Results

## TXRF principle



## What is TXRF?

The S2 PICOFOX working principle is based on the method of total reflection X-ray fluorescence (TXRF) analysis. An air-cooled X-ray tube with molybdenum target generates an X-ray beam, which is reduced to a narrow energy range by a multi-layer monochromator. The fine beam impinges on a polished sample carrier at a very small angle ( $<0.1^\circ$ ) and is totally reflected. The characteristic fluorescence of the sample is emitted and measured in an energy-dispersive X-ray detector. Due to the short distance to the carrier, the fluorescence yield is very high and the absorption by air is very low. The main difference between TXRF and conventional XRF spectrometers is the use of monochromatic radiation and total reflection optics. Illuminating the sample with a totally reflected beam reduces absorption and scattering of the

## ● TXRF principle

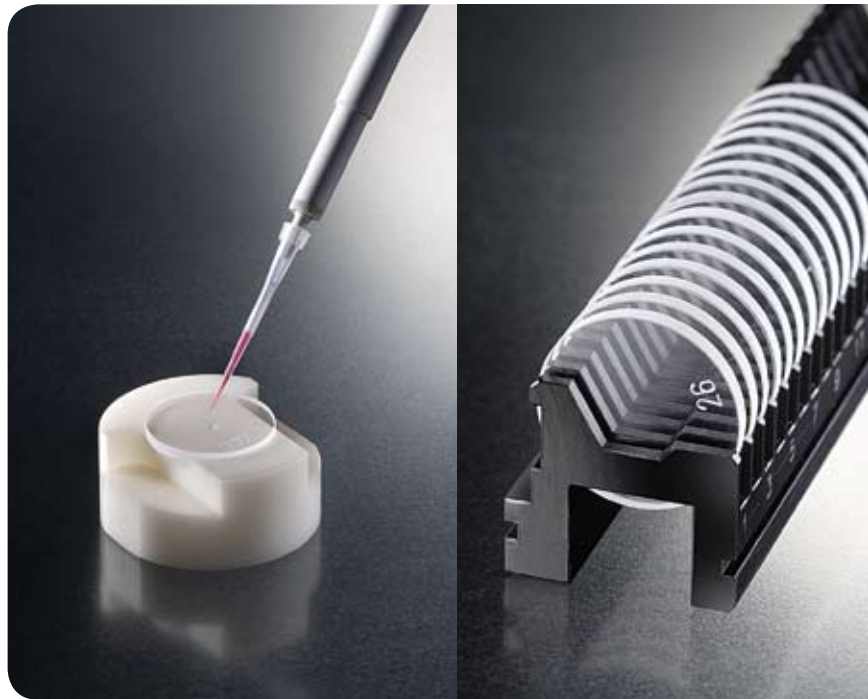
beam in the sample matrix. Resulting benefits include a significantly enhanced fluorescence yield, largely reduced background noise, and consequently much higher sensitivities to elements present even in trace amounts.

### How does sample preparation work?

For TXRF the sample must be applied on a polished carrier made of quartz or acrylic glass. In the case of liquid samples or suspensions, a few microlitres are pipetted directly on a carrier and dried. Powder samples like soils, metals, pigments or biological samples can be applied directly for qualitative analysis. A few particles or micrograms are sufficient. For quantitative analysis, powders must be suspended in a detergent solution and pipetted onto the sample carrier. Filters, wipes, biological tissues and smears require extraction in an ultrasonic bath. For the measurements, the extract solutions are applied on the sample carrier without any further treatment.

### How often is a calibration required?

The S2 PICOFOX comes factory-calibrated and ready to use. Day-to-day quantification of unknown samples then only requires the addition of an internal standard element, such as gallium. Due to the thin sample layer, the fluorescence intensity of an element is directly proportional to its concentration in the sample. Quantitative analysis is highly accurate at all concentrations from ppb to 100 percent, and requires no further calibration by the user.



# Technical data

## S2 PICOFOX



<b>Element range</b>	Mo excitation: Al to U (with exception of Nb to Ru) W excitation: K to U
<b>Concentration</b>	ppb to 100 %
<b>Detection limit</b>	< 10 pg Nickel (Mo excitation) < 2 pg Nickel (Mo excitation with High Efficiency Module)
<b>Sample types</b>	Liquids, suspensions, powders, particles, metals, thin layers, tissues, wipes, filters etc.
<b>Sample volume</b>	Liquids and suspensions from 1 to 50 $\mu$ l Particles up to 100 $\mu$ m in diameter, powders up to 10 $\mu$ g
<b>Sample carrier</b>	25 quartz and 100 acrylic glass carriers (30 mm diameter) included in delivery
<b>Sample changer</b>	Manual version for single samples Automatic version with cassette for up to 25 samples
<b>X-ray tube</b>	50W metal-ceramic, max. 50 kV, 1.5 mA air-cooled, Mo or W target
<b>X-ray optics</b>	Multilayer monochromator
<b>Detector</b>	Peltier-cooled XFlash® Silicon Drift Detector No need for liquid nitrogen 10 mm <sup>2</sup> active area Energy resolution < 160 eV at 100 kcps (Mn K $\alpha$ )
<b>Options</b>	Detector with 30 mm <sup>2</sup> active area High Efficiency Module with 30 mm <sup>2</sup> detector and micro focus tube
<b>Interface</b>	Data exchange by RS232 serial interface Sample changer with RS232 (automatic version)
<b>Mains</b>	100/240V, 50/60Hz, max. power consumption 180W
<b>Size</b>	300 x 590 x 450 mm (height x width x depth)
<b>Weight</b>	37 kg
<b>Accessories</b>	Washing cassette for sample carriers Sample cassette for 25 carriers Starter Set for TXRF (pipettes, tips, racks, tubes, mortar , spatula)

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