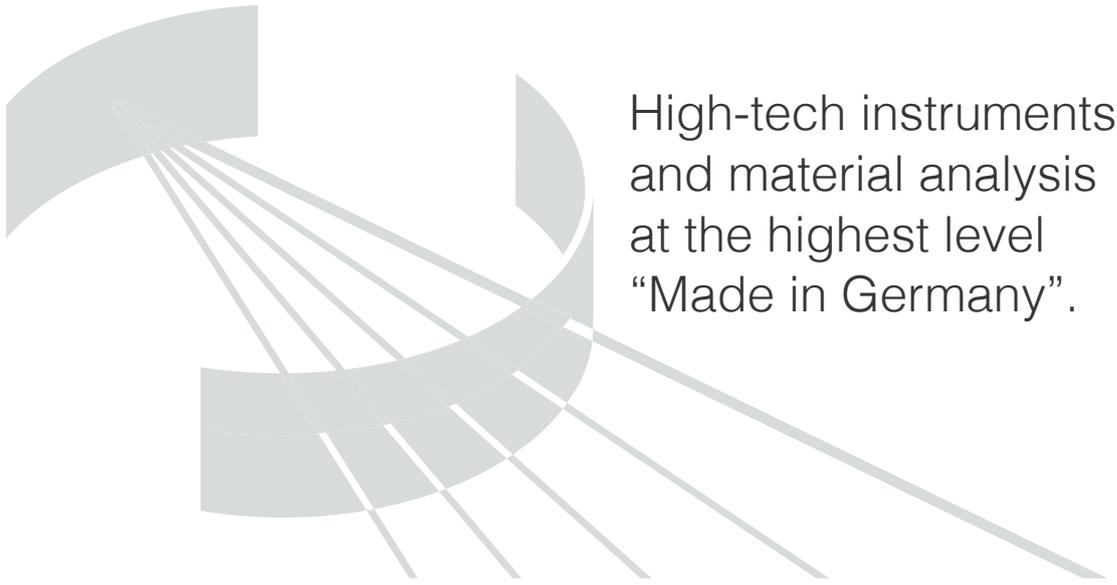


SPECTRUMA
ANALYTIK GMBH

Advanced Analytical Instruments

Company profile



High-tech instruments
and material analysis
at the highest level
“Made in Germany”.

SPECTRUMA Analytik GmbH is a trusted partner and a leading company in the field of instrumental analysis since 1982. At SPECTRUMA, customer service as well as production and engineering of the devices enjoy the same treatment. The company understands to meet the requirements of modern management and to steadily improve cooperation with their customers by not only being equivalent partners in the field of spectral analysis, but also has an outstanding expertise in the application fields like material engineering, foundry, heat treatment, galvanic inspection and surface engineering. Highly skilled experts with over 20 years of experience in production, development and service in the field of

glow-discharge form an innovative and future-oriented team.

All these efforts and achievements have been integrated into a documented system of ISO 9001 and thus promote the customer-oriented development of SPECTRUMA.

SPECTRUMA operates with a high vertical range of production, provides advanced technology “Made in Germany” and offers a caring and comprehensive worldwide customer support.

Convincing by innovation with vision, SPECTRUMA sets up new standards by the continuous cooperation with various industrial sectors and in the development of advanced technology in the field of instrumental analysis.

GDOES

Represented in various industries like metalworking, glass and ceramics, aircraft and aerospace ...



Glow Discharge Optical Emission Spectrometry made its first appearance in 1968 and was designed primarily for bulk spectrochemical analysis of various metals and their alloys.

Since its introduction, this method has been steadily developed and has excelled in the areas of surface and coating analysis as well. Compared with conventional excitation techniques, the striking feature of Glow Discharge Technology is the ability to discern defined surface layers in the material being examined and analyzes their chemical composition.

The analytical information can be obtained not only integral but also spatially

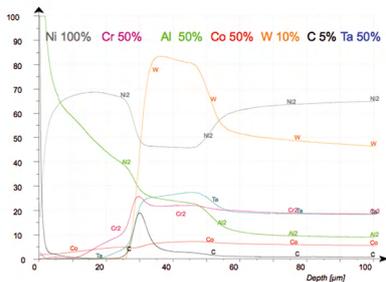
resolved, hence depth profile analysis is made possible.

In the field of metal analysis GDOES is an ideal solution for concentration profile analysis and surface analysis.

Analyzing the surface and near-surface areas of the treated material can monitor all kinds of surface treatment processes as well as surface coating processes.

Coating thickness and chemical composition can be accurately measured using the technique of depth profile analysis. GDOES is the preferred method of analysis for materials that were previously impossible to analyze by traditional methods, and it is one of the fastest methods available.

Evaluation



The spectroscopic instrument

The optical detection system usually is a polychromator based on the "Paschen-Runge mount". The light emission of the plasma is imaged via an entry slit to a holographic grating.

From there the light is diffracted corresponding to the different wavelengths of the element and finally is detected by various detectors.

For Layer characterization in terms of layer thickness and composition two possibilities for the evaluation are used:

Depth profile analysis

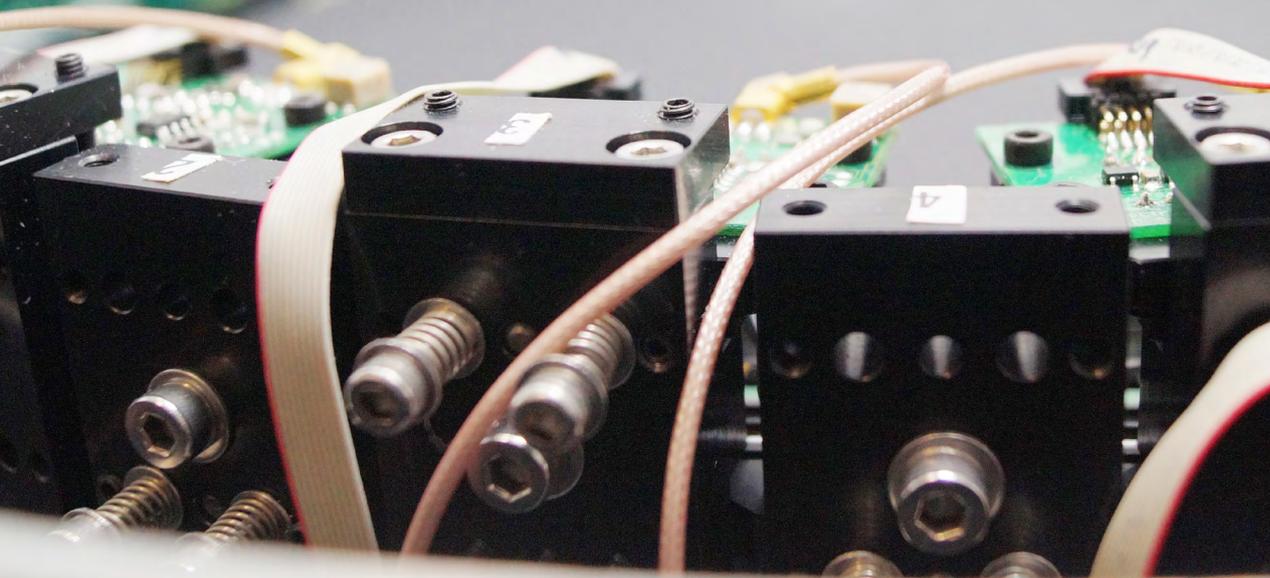
By using depth profile analysis, in-depth concentration differences of an element in a material can be determined quantitatively. In general, the depth profile analysis can be accomplished by recording the analytical signals as a function of time from the initiation of the discharge. Based on sputtered depth one can determine information on the different layers of the material.

Bulk analysis

In addition to depth profile analysis of layers, it is possible to determine the average concentration of elements in a material. For this purpose the concentrations of the elements are determined by an integrating measurement of many intensities.

With a suitable calibration, the percentage composition of the sample is calculated. The material to be tested is measured by a pre-installed database that can be supplemented at any time.

Inside spectroscopy



The combination of different optics creates best conditions for a fast data analysis with highest performance.

The PMT-optics

The PMT optics offers the advantage of a fast data acquisition with high sensitivity of photomultiplier tubes (PMTs). It is equipped with a 2400 grooves/mm master grating with a focal length of 750 mm. Up to 79 emission lines can be detected with selected photomultiplier tubes simultaneously. The polychromator vessel is evacuated to extend the spectral range into the deep VUV region allowing the observation of wavelengths down to 120 nm.

Elements of interest like nitrogen, carbon, oxygen, sulphur and phosphorous are easily detected using their most sensitive first order spectral lines. Prior to delivery of the device, this optic is always configured to customer specification.

High Resolution CCD Optics

High performance CCD detectors are used to record the information for the complete spectrum. The spectral range in the standard optical configuration encompasses all wavelengths from 120 nm to 800 nm. Almost all elements are covered within this range.

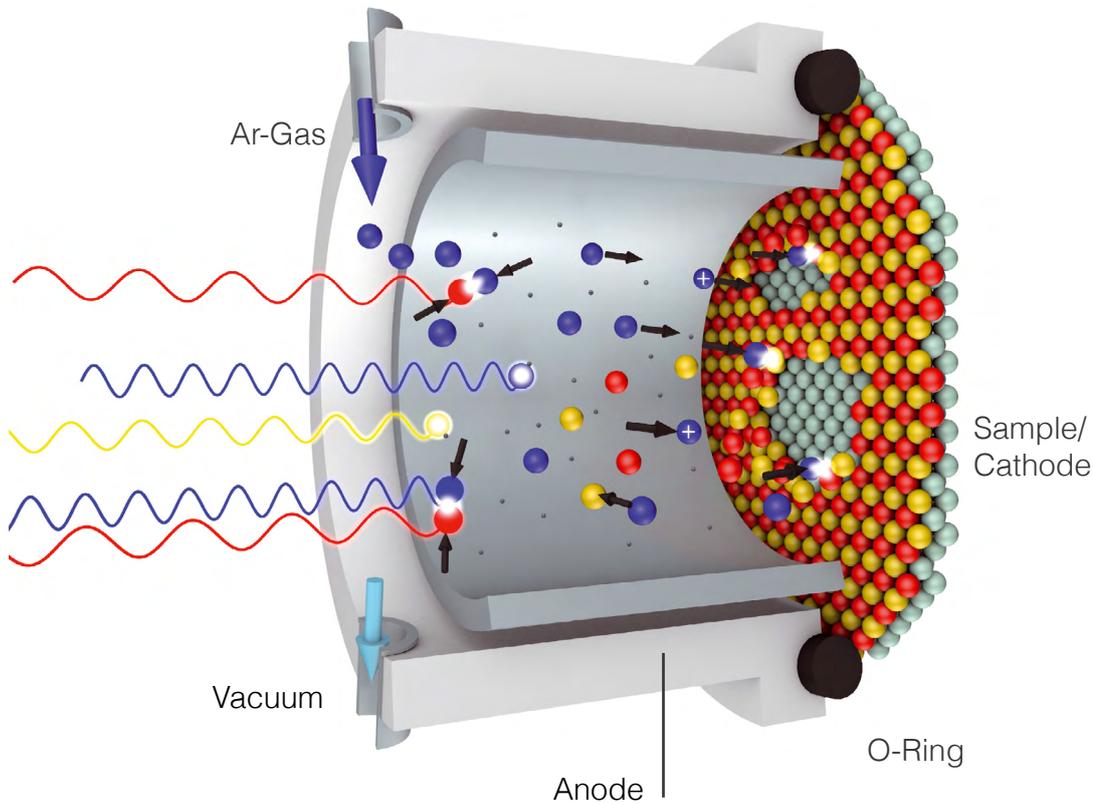
The spectral resolution of the CCD spectrometer can be as good as 20 pm and well suited for the recording of the spectral lines in many materials.

Monochromator

Unlike polychromators, monochromators are used to select a single wavelength of an emission spectrum at a time. In the monochromator three different diffraction gratings are installed, in order to provide always a high degree of efficiency over the whole spectral range and to optimize optical resolution. The sequentially operating monochromator of SPECTRUMA covers a spectral range from 200 nm to 1200 nm.

Principle of operation

Each device of SPECTRUMA can be equipped with variable anode sizes of 1 mm, 2.5 mm, 4 mm and 8 mm, which determines the area to be examined.



- By putting high DC voltage between the hollow anode and the sample, argon gas is ignited at a low pressure and a plasma is created.
- The homogeneous field distribution ensures that the sample surface is eroded rather evenly by bombardment of energetic argon-ions.
- The released atoms of the sample diffuse into the plasma. This whole process is known under the name cathodic sputtering.
- In the plasma region, the sample atoms are excited by collisions with high-energy electrons and metastable argon ions. The excited atoms are emitting a characteristic line spectrum.
- The line spectrum of the respective element is detected by a detection system and converted by the software in specific concentration values.

→ Conclusion

In DC plasma, the sample to be tested is utilized as a cathode that is sealed with an O-ring. The ablated surface of the sample depends upon the diameter of the anode.

Specifications

RF-Glow discharge lamp

For the analyzing of non-conductive-material such as paints, lacquers, and other non-conductive layers, as well as of oxides, SPECTRUMA has developed the RF generator with pulse mode. An outstanding feature of the RF generator is that it produces stable plasma conditions in a very short time by its free running concept, which ensure the save measurements of near-surface layers.

SPECTRUMA's RF generator does not require a time-consuming matching network of conventional RF generators. The cathode sputtering in pulse mode can be adjusted from a few micro to milliseconds. The sample is cooled between pulses, which simplifies the analysis of thermally sensitive samples. Without this function, the analysis of thin-film photovoltaic cells would be difficult to perform.



Universal sample unit

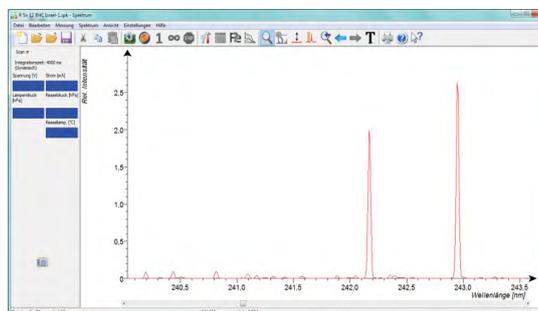
The Universal sample unit (USU)

The universal sample unit is one of SPECTRUMA's special tools used for the analysis of samples of various sizes and shapes. In addition, even very thin samples can be measured directly, which might otherwise not withstand the mechanical stress by the vacuum.

WinGDOES

SPECTRUMA wants all users to experience the most advanced analytical instrumentation by a state of the art software system. Subsequently SpectrUMA has developed WinGDOES, a Software which collects all the important measurement data, and to give the users the insight and control over their instrument they need. WinGDOES represents the link between the users and the GDOES and is created according to the latest standards of graphical user interface design. Users can easily be familiarized with WinGDOES because it resembles common office-software. Furthermore the software complies with the high requirements of ISO documentation.

WinGDOES





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