SPECTRUMA
ANALYTIK GMBH

GDA Alpha

Glow discharge analyzer for bulk and depth profile analysis

The GDA-Alpha

Big ideas made compact...

Glow **d**ischarge **o**ptical **e**mission **s**pectroscopy has great reputation for its capabilities of depth profiling, but more than 40 years ago this technique was invented for the bulk analysis of precious metals. Coming back to the roots and combining it with all the new technologies developed over the last decades, SPECTRUMA created the most performant GDOES-spectrometer for bulk analysis, as well as for depth profile analysis. The desktop instrument GDA-Alpha is an innovative glow discharge analyser, which convinces by new technical developments and its appealing size. The space-saving instrument GDA-Alpha combines SPECTRUMAs state-of-the-art CCD optics with very high resolution and by this means can cover a wide range of applications. Through constant innovation users find a cost-optimized instrument without compromising on technical performance. Application fields of the GDA-Alpha are the bulk analysis of complex alloys as well as depth profiling of coated materials. All elements of interest, and even H, O, Na, Li, K can be analyzed with high detection limits. Thus, the GDA-Alpha is outstandingly suitable for use in the industry during production control, quality assurance, and incoming inspection. Convincing by the efficient, user-friendly handling, the GDA-Alpha can be completely integrated without necessary extensions into working processes of its users.

Technical Data

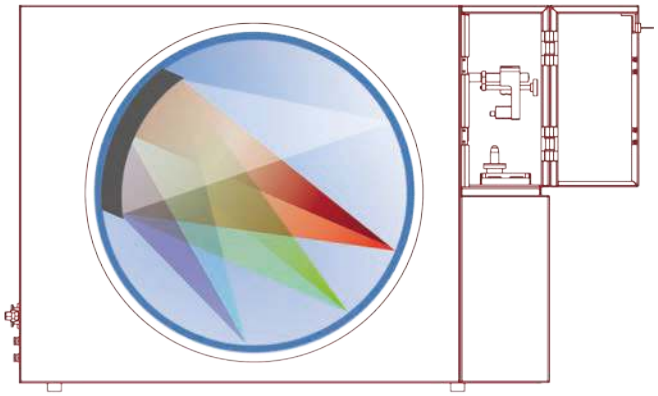
Glow **d**ischarge **o**ptical **e**mission **s**pectroscopy

GDOES found their place in the routine analysis of solid materials offering a rapid depth profile analysis on materials with layer structures, e.g. heat treatment, zinc coatings, galvanizing. The ability to perform a proper bulk analysis is not only a prerequisite for that kind of measurement. There is a wide range of applications of bulk material analysis in production control or incoming inspection. The glow discharge source is of the Grimm type design with the sample acting as electrode and sealing the source. The instrument can be equipped with anodes of 2.5 mm, 4 mm, and 8 mm inner diameter defining the size of sputter crater and the required sample surface. The optical detection system is designed as a polychromator based on the Paschen-Runge mount. The polychromator is equipped with a 2400 grooves/mm master grating with a focal length of 400 mm. The polychromator vessel is evacuated to extent the spectral range into the deep VUV region allowing the observation of wavelength down to 120 nm. Elements of interest like Nitrogen, Carbon, Sulphur and Phosphorous are easily detected using their most sensitive first order spectral lines. An array of CCD detectors covers the spectral range from 120 nm to 520 nm. This adds flexibility in the choice of elements to be analyzed and spectral lines to be used without technical changes. The GDA-Alpha is factory calibrated using certified reference materials according to the customer's analytical program. One of the big advantages of GDOES is the linearity of these calibrations. SPECTRUMAs HDS mode allows the detection of wide concentration ranges using always the best signal evaluation possible. Setting up samples for drift correction or the adoption to a different set of discharge conditions is provided for each analytical method ordered with the instrument. A recalibration history offers an easy overview of the conditions of the instrument. Furthermore it is possible to include control chart samples in the methods to assure the permanent quality of the analysis. The standard sources require a flat sample surface from 20 mm diameter (8 mm anode) to 6 mm (2.5 mm anode). This surface has to seal the glow discharge source. The quality of this sealing is determining the analytical results especially on those elements that are influenced by atmospheric contamination like oxygen and nitrogen. The sample surface must be dry and free of oil; even low oil contamination will be detected. For bulk analysis a possibly contaminated surface can be removed by grinding. This should be a dry grinding process using aluminium oxide paper of grain 300. The discharge conditions for the various applications will be predefined in the analytical methods. Each bulk method will include optimized evacuation and purging time for the source, a preglow time to remove a possibly contaminated sample surface and the analysis time, where the emission line intensity for the elements of interest is evaluated. Depending on the analytical task the total time for one run is ranging from 35 s to 80 s. Results are presented as a bulk table. They can be stored in an internal database for statistics and printed out using a customer-defined layout. A material quality database is included in the software; the direct comparison with a given quality or the search for matching data is possible directly after the measurement. Data export to standard office applications or LIMS systems is done easily.

In Detail...

Optics

- Self-adjusting CCD optics with thermal stabilization
- Rowland circle design with focal length of 400 mm
- Excellent spectral resolution better than 0.022 nm (FWHM)
- Standard wavelength range 150 nm – 520 nm
- Optional: H, O, Na, Li, K, F elements
- Limit of Detection: 0,1 ppm – 50 ppm
- Thermal stabilization provides high stability of the optical system
- Emission lines for nearly all elements of the periodic system can be detected



Height	Width	Length	Weight
675 mm	390 mm	950 mm	95 kg

Electronics

- Device electronics with multi-processor technology
- Permanent monitoring of the GDS functions (pressure, voltage, power, etc.)
- Precise and quick error diagnosis, optional remote diagnosis function
- Communication with external PC via standardized Ethernet TCP/IP interface or USB

Vacuum system

- Stainless steel tubing in the whole system ensure trace element analysis (in particular for nitrogen) by avoiding contamination
- One modern three-phase rotary vane vacuum pump both for optics and GDS-source
- Noise level <50dB
- Long term stability by using one closed vacuum system

Excitation source

- The excitation source permits anode diameters ranging between 1 mm and 8 mm with optimum stability and reproducibility

Option: USU – Universal sample unit

- For analysis of geometrically complicated and small samples
- Analysis of round / curved samples like tubes and balls
- Analysis of porous samples

Universal sample unit

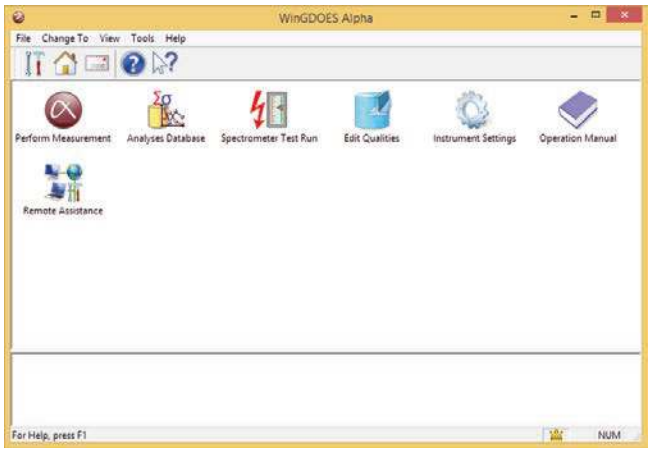
The Software

WinGDOES

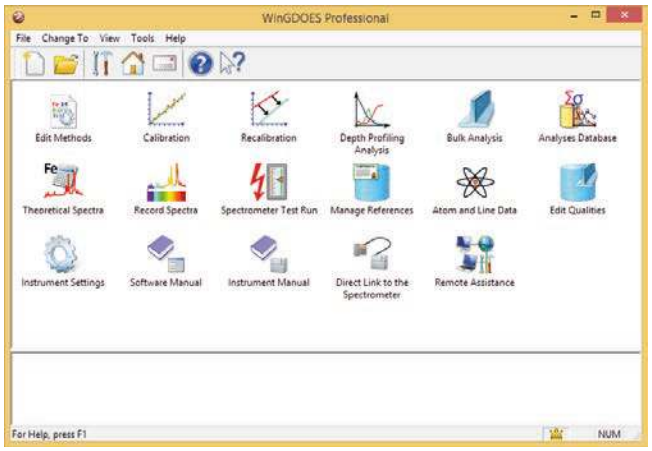
Operating System:

- Software with Windows 10 Professional
- 8 GB RAM
- Hard disk 256 GB SSD
- Full HD-Display

WinGDOES Alpha



Optional: WinGDOES Professional

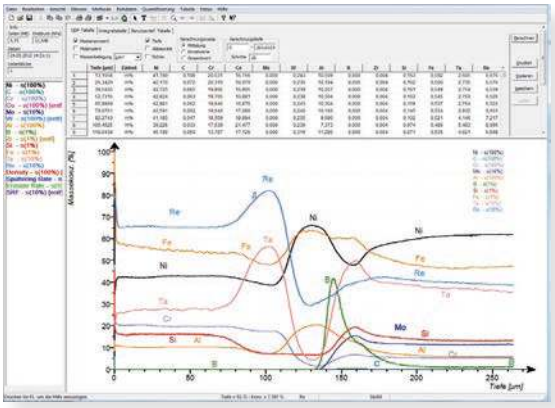


Basic software

- Bulk analysis module
- Automatic storage of test results for statistical evaluations
- Results stored in database
- Export filter to transmit the data to other programs
- Software available in German and English
- Optional: WinGDOES-Professional

- Depth profile analysis with quick quantification in routine analysis of conductive samples. After quantification the following results and display options are available:

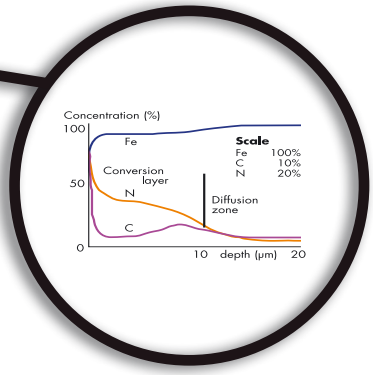
  - Concentration (weight or atom percentage) vs. depth
  - Bulk concentration in definable depth ranges
  - Coating weight (g/m2) of individual or all elements in definable depth ranges
  - Sputter rate (µg/Ws) vs. depth
  - Density (g/cm3) vs. depth
  - Simultaneous presentation of several depth profiles for comparison purposes



Sample applications

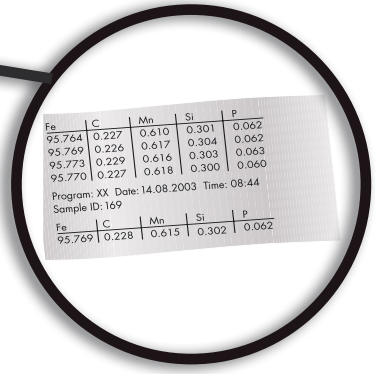
Thermochemical treatments

- Determination of layer thickness and concentration profiles for all elements
- Quantification and/or qualification of surface contamination, inclusions and phase ratios



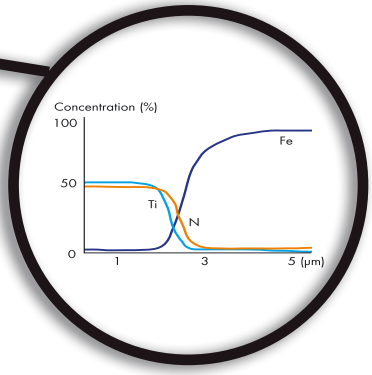
Chemical composition

- Precise determination of chemical material composition
- High reproducibility of analyses



Coated sheets

- Complete characterisation of the coating layer in regard to chemical composition, thickness and element distribution



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