



photo courtesy of AB Supply Steel

**LECO**<sup>®</sup>

**GDS850A Glow Discharge Spectrometer**

# GDS850A

## Glow Discharge Spectrometer

LECO Glow Discharge Atomic Emission Spectrometers (GD-AES) are the clear choice of leading companies around the world, providing the most accurate bulk analysis, as well as quantitative depth profiling for a wide variety of sample matrices and applications.

Delivering customers a true turn-key solution, the GDS850 is configured and calibrated at the factory, in order to provide a custom analytical tool optimized to your sample matrices. Due to the robust nature of the system, samples can be analyzed immediately after installation. Only LECO provides this level of customization and customer support.

Using the latest technology in hardware and software, the GDS850A is designed to enhance the performance of both process control and R&D applications. This instrument covers a wide spectral range (120 to 800 nm) and allows for custom configurations of up to 58 channels. Compared with spark sources, GD-AES employs a non-thermal glow discharge source for atomic excitation. Excitation of the atoms occurs in the glow discharge plasma discretely apart from the sample surface thereby reducing the metallurgical and chemical history inherent in all samples. Emission of ion wavelength spectra is almost completely eliminated thereby giving rise to less complex spectra typical of thermal excitation sources.

This unique method of excitation results in true bulk analysis providing a distinct advantage in accurately identifying chemical compositions, especially of difficult materials, over other excitation methods.



### GDS advantages over other analytical techniques

- Separation of sputtering and excitation
- Linear calibration curves with wide dynamic range
- Less self absorption and no material re-deposition
- Atomic emission consists primarily of ground state atom lines, resulting in fewer lines and reduced interferences
- Freedom from metallurgical and chemical history
- Fewer standards required for calibration
- Minimal memory effects for a quick matrix change
- Low Argon gas consumption
- Automatic cleaning between samples



## Accurate Bulk Analysis

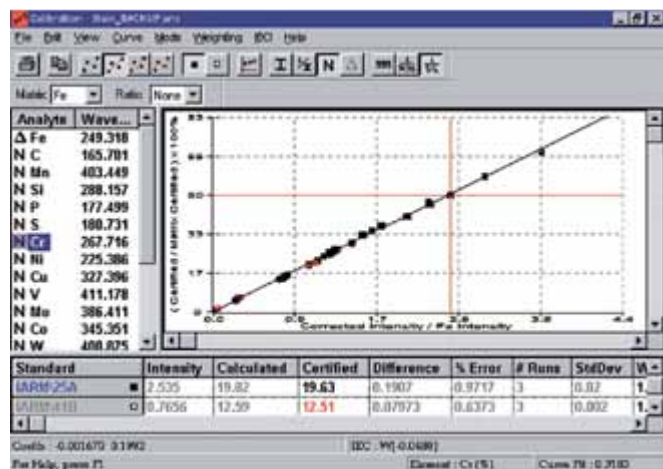
Ideal for foundries, die casters, smelters, and all ferrous/nonferrous applications.

Name	Fe (%)	Si (%)	Mn (%)	P (%)	S (%)	Al (%)	Cr (%)	Ni (%)	Mo (%)	Cu (%)	Ti (%)	Au (%)
11 # NIST1781	99.8	0.084	0.711	0.038	0.033	0.180	1.00	0.235	0.010	0.103	0.308	0.143
12 # NIST1781	99.8	1.508	0.716	0.036	0.036	0.180	2.82	0.238	0.012	0.103	0.305	0.138
13 # NIST1781	99.8	1.508	0.716	0.036	0.036	0.179	2.82	0.238	0.012	0.103	0.305	0.138
14 # NIST1781	99.8	0.208	2.02	0.033	0.038	0.184	1.10	0.238	0.100	0.100	0.300	0.000
15 # NIST1782	96.1	0.231	2.08	0.033	0.028	0.243	1.17	0.238	0.108	0.208	0.321	0.000
16 # NIST1783	96.1	0.231	2.08	0.033	0.028	0.243	1.17	0.238	0.108	0.208	0.321	0.000
17 # NIST1783	96.0	0.188	1.88	0.011	0.020	0.021	0.914	0.008	0.208	0.110	0.020	0.313
18 # NIST1783	96.0	0.188	1.88	0.011	0.022	0.018	0.915	0.008	0.208	0.107	0.022	0.309
19 # NIST1783	96.0	0.185	1.88	0.011	0.023	0.023	0.911	0.008	0.208	0.107	0.023	0.308
20 # NIST1784	95.5	0.308	1.23	0.020	0.012	0.020	0.208	1.48	0.185	0.188	0.511	0.028
21 # NIST1784	95.5	0.301	1.23	0.020	0.013	0.020	0.208	1.48	0.185	0.187	0.511	0.028
22 # NIST1784	95.5	0.304	1.24	0.020	0.012	0.020	0.208	1.48	0.185	0.187	0.511	0.028
23 # NIST1784	95.5	0.304	1.24	0.020	0.012	0.020	0.208	1.48	0.185	0.187	0.511	0.028
24 # NIST1784-12	1.28	2.81	0.202				0.728					
25 # NIST1784-12	1.28	2.82	0.206				0.728					
26 # NIST1784-12	1.27	2.84	0.208				0.728					
27 # NIST1784-20				0.028	0.008	0.188		1.58	0.0718	0.0128	0.0001	0.012
28 # NIST1784-20				0.040	0.004	0.188		1.58	0.0713	0.0128	0.0003	0.012
29 # NIST1784-20				0.040	0.004	0.188		1.58	0.0713	0.0128	0.0003	0.012
30 # NIST1781	99.1	1.81	0.887	0.041	0.033	0.189	1.88	0.220	0.0000	0.0001	0.270	0.191
31 # NIST1781	99.0	1.81	0.888	0.041	0.032	0.188	1.88	0.220	0.0000	0.0001	0.270	0.179
32 # NIST1781	99.0	1.82	0.888	0.041	0.032	0.178	2.00	0.220	0.0000	0.0002	0.266	0.178
33 # NIST1782	94.1	0.228	2.02	0.023	0.027	0.242	1.18	0.010	0.185	0.239	0.110	0.094
34 # NIST1782	94.1	0.208	2.02	0.024	0.027	0.242	1.18	0.010	0.188	0.241	0.110	0.094
35 # NIST1782	94.1	0.228	2.01	0.024	0.027	0.242	1.18	0.010	0.185	0.239	0.110	0.094
36 # NIST1783	96.0	0.187	1.88	0.012	0.021	0.021	0.914	0.010	0.208	0.108	0.020	0.309
37 # NIST1783	96.0	0.187	1.88	0.012	0.021	0.021	0.914	0.010	0.208	0.108	0.020	0.309
38 # NIST1783	96.0	0.187	1.88	0.012	0.021	0.021	0.914	0.010	0.208	0.108	0.020	0.309
39 # NIST1783	96.0	0.187	1.88	0.012	0.021	0.021	0.914	0.010	0.208	0.108	0.020	0.309
40 # NIST1784	95.5	0.376	1.21	0.020	0.011	0.020	0.205	1.45	0.187	0.185	0.508	0.038

Multiple sample presentation of bulk data using the GDS850A Glow Discharge spectrometer displaying all samples analyzed in a simple organized spreadsheet.

Analyses	AVG	Calculated	Certified	Difference	Rel. Error	Burn 1	Burn 2	Burn 3
Fe (%)	94.1	94.0	94.1	-0.0211	0.022	94.1	94.1	94.1
Cr (%)	0.231	0.234	0.237	-0.0046	1.911	0.230	0.231	0.231
Mn (%)	0.87	0.87	0.88	-0.0148	1.685	0.87	0.88	0.88
P (%)	0.023	0.023	0.023	0.0000	0.000	0.023	0.023	0.023
S (%)	0.030	0.031	0.030	-0.001	3.337	0.029	0.029	0.029
Si (%)	0.243	0.243	0.246	-0.0077	3.194	0.244	0.241	0.243
Ni (%)	1.18	1.18	1.18	0.0000	1.000	1.18	1.18	1.17
Cr2 (%)	0.028	0.024	0.020	0.0188	2.038	0.028	0.028	0.028
V (%)	0.188	0.187	0.200	-0.00188	0.900	0.188	0.188	0.188
Mo (%)	0.209	0.202	0.200	0.00671	3.280	0.200	0.200	0.200
Cu (%)	0.128	0.128	0.128	0.00000	0.000	0.128	0.121	0.121
Ti (%)	0.002	0.002	0.002	-0.000	0.000	0.002	0.002	0.002
Au (%)	0.070	0.070	0.069	0.001	1.324	0.070	0.070	0.070
Voltage	10.343	0.000	0.000	10.343	10.343	10.343	10.343	10.343
Current	44.848	0.000	0.000	44.848	44.848	44.848	44.848	44.848

Single sample screen of a certified check standard can be easily monitored for elements of interest and accuracy.



## Calibration Screen

Use the Windows®-based toolbars and drop-down menus to select a variety of analytical procedures. Simply select a method, choose the samples and standards to be analyzed, and start.

The software allows sampling rates of up to 2000 data points-per-second regardless of the number of channels selected. Results from ppm levels can be viewed on a large color monitor.

# QDP

## Quantitative Depth Profiling (QDP) Solutions

QDP is an ideal method for early identification of potential problems with your materials (including coatings, layers, and thermochemical treatments). Why use GDS? The GDS technique can perform a depth profile analysis continuously from nanometers to hundreds of micrometers. Combined with a fast sputtering rate (0.5  $\mu\text{m}$  to 30  $\mu\text{m}/\text{min.}$ ), GDS provides the complete chemical composition (ppm to 100%) from the surface to the substrate in only a few minutes. All elements are acquired simultaneously, increasing sample throughput while minimizing cost-per-analysis.

### QDP Applications

Your instrument will be fully calibrated for your specific application upon delivery.

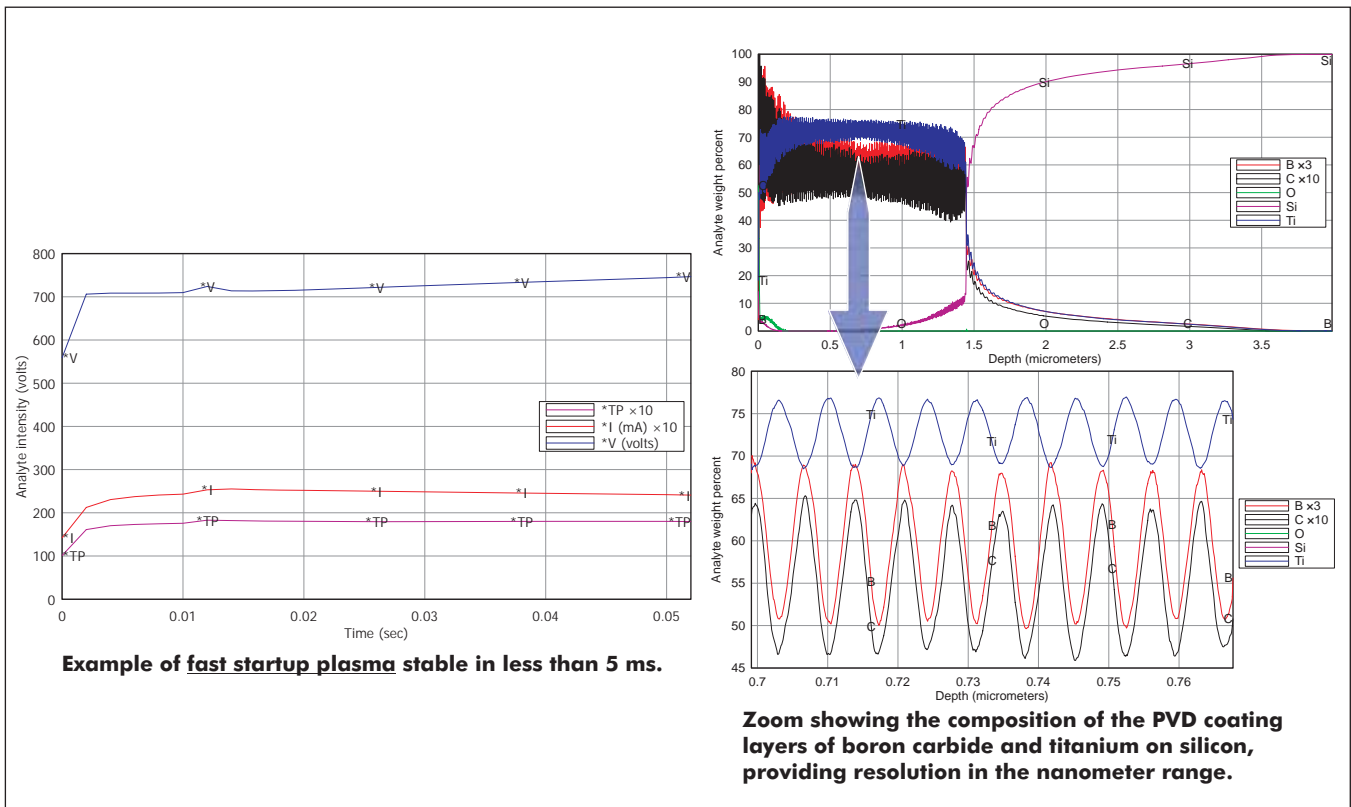
- Galvanizing (EG, Hot Dip, Galvalume, Galvaneal, Galfan, Zinc-Nickel)
- Plating (Sn, Cr, Cd, Ni, Cu)
- Thermochemical treatments (Carburizing, Nitriding, Carbonitriding)
- Hard coatings made by PVD/CVD
- Clad (Aluminum)
- Oxide layers
- Organic coatings
- Semiconductors
- Glass/Ceramics

### QDP Quickly Identifies

- Contamination and cleanliness at the surface and interfaces
- Migration and diffusion at interfaces
- Heterogeneity of coating/substrate
- Adherence issues
- Oxidation/corrosion
- Inclusion/blister
- Chemical composition
- Layer thickness/coating weight

## Thin Alternating Multi-Layers

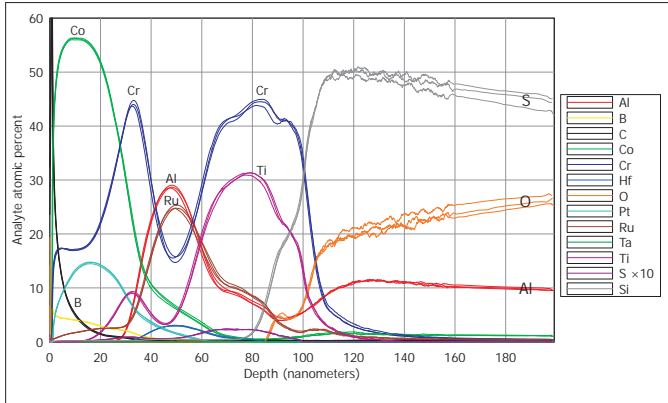
LECO offers you the ultimate Glow Discharge Spectrometer capable of quantifying thin alternating multi-layers.



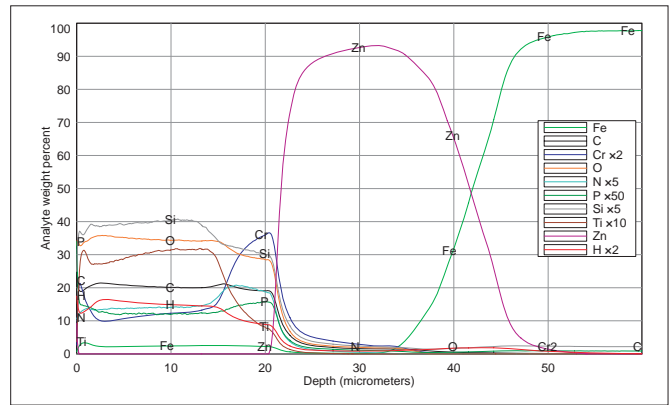


## Quantitative Depth Profiling (QDP) Solutions

Meeting production, process, and research requirements.

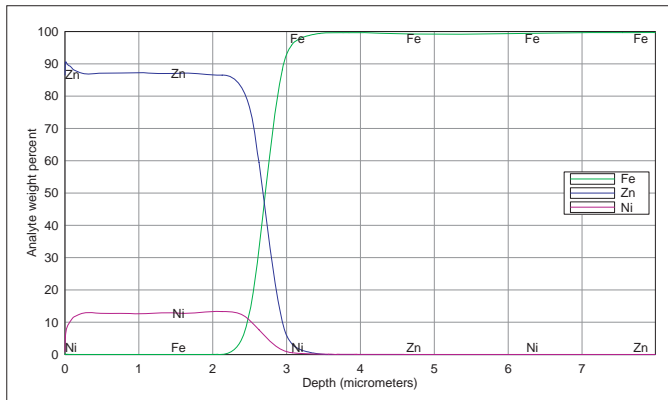


**QDP analysis of organic coatings. QDP of painted steel sheet showing three different organic layers—topcoat paint and primer—on the galvanization (Zn).**



**QDP of the corrosion-resistant electro-galvanized Zn/Ni coating on the surface of sheet steel, showing coating thickness, weight, and alloy composition.**

Name	Zn Depth, $\mu\text{m}$	Coating Wt, $\text{g}/\text{m}^2$	Zn%	Ni%
Zn-Ni 1	2.72	19.93	87.36	12.61



**QDP analysis of multilayer sample, including conductive and non-conductive layers. Example of TiN, TiCN,  $\text{Al}_2\text{O}_3$ , TiN, and TiCN on cemented carbide. Display of Atomic % vs. Depth for stoichiometry check.**

