Quantitative Depth Profile (QDP) Analysis of Iron Phosphate on Steel

LECO Corporation; Saint Joseph, Michigan USA

Instrument: GDS850A

- Iron Phosphate Coating Weight
- Coating Thickness
- Coating Composition

Introduction

In this performance note iron phosphate coated steel was analyzed on the GDS850A for characterization of the coating. Phosphate coating is the treatment of steel with a dilute solution of phosphoric acid and other chemicals in which the surface of the metal is converted to an integral, mildly protective layer of insoluble crystalline phosphate. The solution can be applied by either immersion or spraying, depending on the sample geometry. The process produces a uniform non-metallic phosphate coating, which inhibits corrosion and increases the adhesion and durability of paint finishes.

Analytical Parameters for Iron Phosphate Coated Steel

Method Parameters

Anode Diameter:	4 mm
Lamp Type:	DC
GDS Operating Conditions:	20 mA, 700V
Discharge Stabilization:	Current (Control Mode)/Voltage (Pressure Control)
Minimum Data Acquisition Rate:	100 s^{-1}
Profile Duration:	120 s (thickness dependant)
Cooling:	Cooling, 15°C

An overlay of five replicate analyses is shown in Figure 1. The plot is displayed in concentration in weight percent versus depth in micrometers (µm). Characteristics of the coating were calculated using GDS850A software and displayed in Table 1. The table includes the coating depth in micrometers (µm), coating weight in grams per square meter (g/m²) and concentrations of Fe, P, and O.

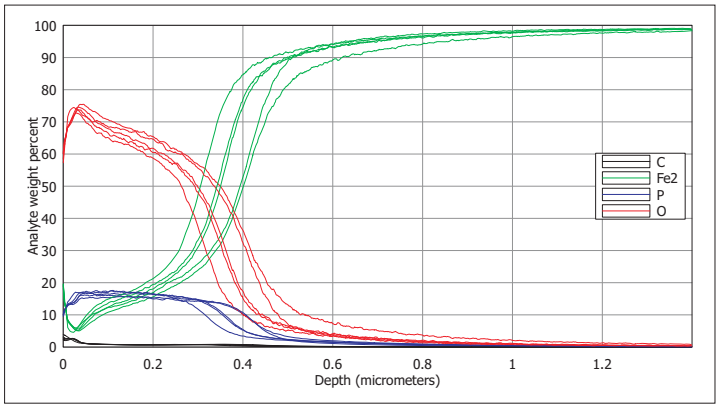

Figure 1

Notes	Depth, µm	Coating Wt, g/m²	Fe% Coating	O% Coating	P% Coating
1	0.51	1.79	36.7	51.1	12.2
2	0.43	1.49	35.1	51.4	13.5
3	0.39	1.39	38.1	48.6	13.3
4	0.47	1.60	33.1	53.5	13.4
5	0.43	1.49	36.3	50.2	13.6
Mean	0.45	1.55	35.9	51.0	13.2
Rsd	10	9.82	5.24	3.51	4.32

Table 1

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Spectroscopy Performance Note