

# Spectroscopy Performance Note

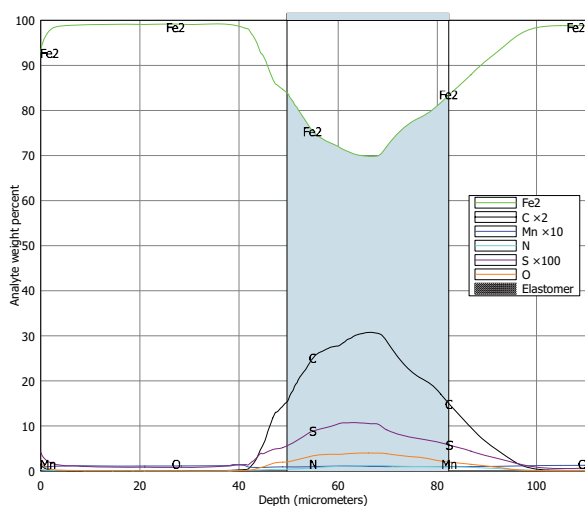
## Quantitative Depth Profile (QDP) Analysis of Elastomer Bonded Steel Sandwich



### Introduction

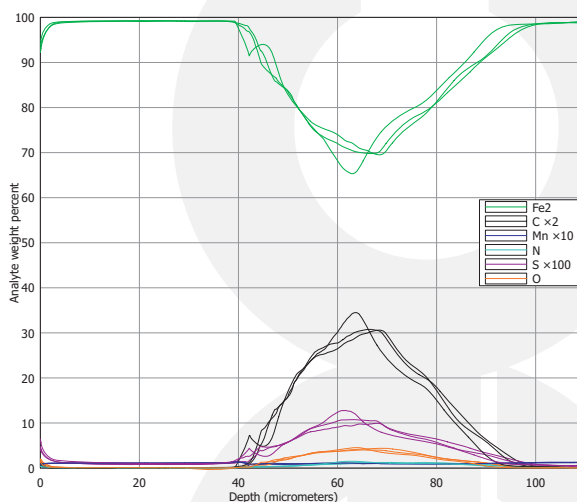
The LECO GDS850A represents the latest technology available for highly accurate bulk analysis and quantitative depth profiling for coatings analysis, layers, and surface treatments. The GDS850A is designed to enhance your performance requirements for both process control and research and development applications.

A novel application for GD-AES is the determination of the thickness of an elastomer bonding layer between two sheets of steel. The LECO GDS850A was used with a 4 mm RF lamp. The optional RF Sample Cooling Kit was used to prevent overheating, preferential sputtering, volatilization, and to eliminate softening.



| Name | Elastomer, $\mu\text{m}$ | Full Depth, $\mu\text{m}$ |
|------|--------------------------|---------------------------|
| 8:2  | 32.6                     | 117                       |

**Figure 1: Analysis indicating thickness and composition of the elastomer layer.**



| Name | Elastomer, $\mu\text{m}$ | Full Depth, $\mu\text{m}$ |
|------|--------------------------|---------------------------|
| 8:2  | 32.6                     | 117                       |
| 8:3  | 31.9                     | 112                       |
| 8:5  | 29.7                     | 113                       |
| Mean | 31.4                     | 114                       |
| Rsd  | 4.82                     | 2.32                      |

**Figure 2: Replicate analyses demonstrating reproducibility.**

### Summary

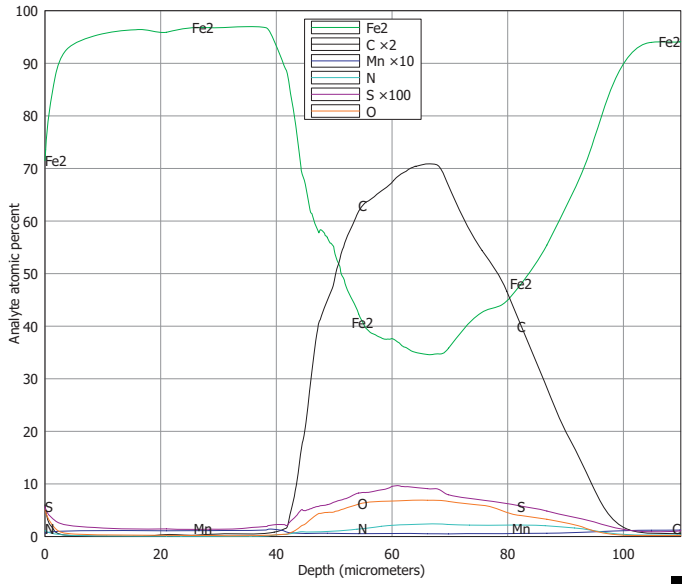
One side of the sample was ground down leaving a thin layer of steel over the elastomer. The sample was analyzed from the top steel through the elastomer and into the bottom steel layer. Results of the fully quantified depth profile analysis performed on the GDS850A are shown in Figure 1 and replicate analyses are shown in Figure 2. Thickness calculations were performed at standard criteria of the depth where the matrix element is 84% of the maximum matrix concentration. Figure 3 shows the same analysis displayed in atomic percent versus depth. For comparison, a measurement of the elastomer layer using the PAX-it™ Basic Measurement Module on a LECO Image Analyzer was acquired.

The full thickness of the steel-elastomer "sandwich" is shown in Figure 4, indicating that each sheet of steel is ~1 mm in thickness.

Image analysis measurements are shown in Figure 5.

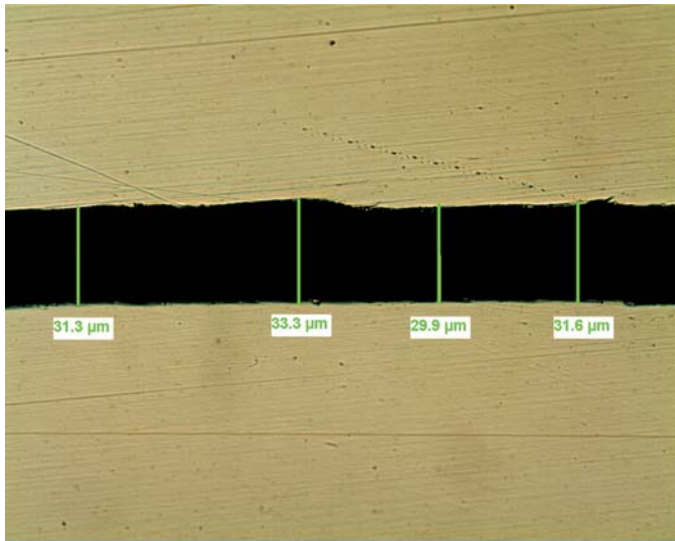
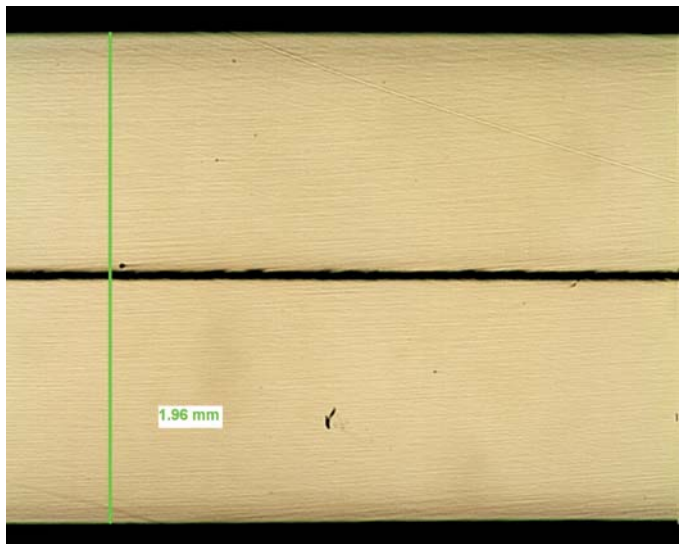
The GDS and Image Analysis results compare favorably.

# GDS850A



**Figure 3: Analysis displayed in atomic percent versus depth.**

**Figure 4 (50x): Image Analysis measurement of full sample thickness.**



**Figure 5 (500x): Image Analysis measurement of elastomer thickness.**



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