



Application Note #1902

Coating Thickness Measurements by HHXRF: Silver or Tin Coatings for Electrical Contacts

Composition and thickness of coating materials are optimized to increase the durability and overall lifetime of components, equipment and tools used in demanding environments. These critical pieces need to withstand high temperature, humidity, pressure, corrosiveness and friction. They usually also need to look attractive and robust.

Common coating processes include selective plating, conventional electroplating, mechanical plating, galvanized coating, sputtering, physical or vapor deposition, thermal spray coating, ion plating, chromate conversion and phosphate coating. Properties needed for specific working requirements of a given piece are considered in the selection.



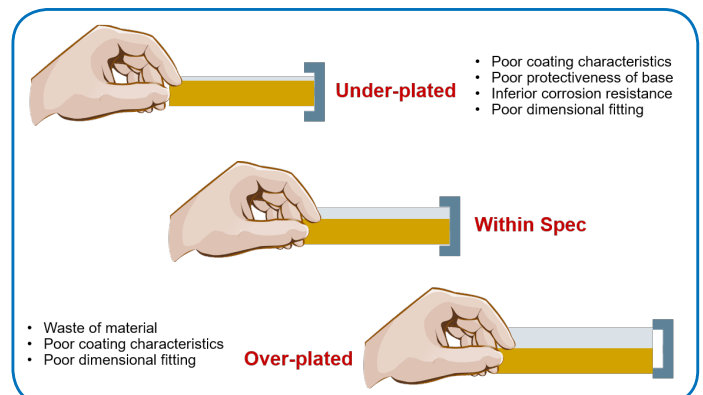
Handheld XRF (HHXRF) is the perfect tool for point-and-shoot coating composition and thickness measurements of small and large parts as well as for difficult-to-reach locations. HHXRF is used for general metal finishing, power equipment, transportation, construction and sports applications.

Bruker's S1 TITAN 800 or 600 HHXRF is ideal for fast, straightforward measurements of coating composition or thickness.

Coatings for Electrical Contacts

Silver (Ag) and tin (Sn) coatings are often used for power switches and connectors. These coatings on components can provide high corrosion, wear and impact resistance as well as improve solderability and increase conductivity.

The accurate and precise thickness of coatings on components is critical to the success of the process. If a piece is over-plated, it is a waste of material, has poor coating characteristics and poor dimensional fitting. Conversely, if a piece is under-plated, it has poor protectiveness of the base, inferior corrosion resistance along with poor coating characteristics and poor dimensional fitting.

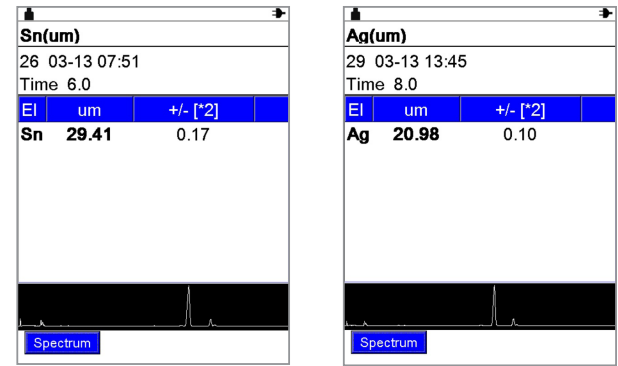


Fast, Straightforward Coating Measurements

Manufacturers who provide pieces with optimal coating material and thickness can easily confirm quality product with a fast HHXRF measurement. Likewise, end users can QC incoming material and check in-use product just as quickly.

Bruker provides various calibration options with its S1 TITAN Handheld XRF. These options enable the user to determine how to get answers in the format most useful to an operation. Options include qualitative coating analysis, type standardization of standard alloy calibrations, ready-to-go coating calibrations preinstalled by Bruker and user generated EasyCal calibrations.

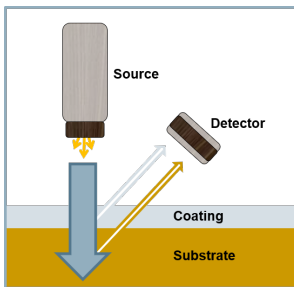
30µm Sn and 21µm Ag Coating Thickness Results Screens



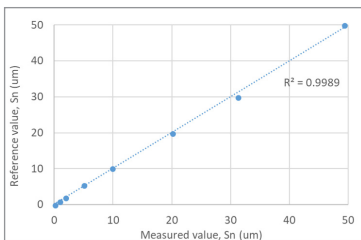
The S1 TITAN provides coating thickness results in seconds

Non-Destructive XRF for Coating Analysis

1. X-rays from a primary source can penetrate and excite matter
2. X-rays are attenuated in characteristic ways passing through matter
3. Signals from base material and covered layer can both be detected



4. Signal strength is used to determine the coating thickness
5. A second reading determines the thickness of the substrate
6. Calibrations with excellent correlation can be preloaded on the S1 TITAN for accurate and repeatable coating measurements



Accuracy of tin coating for 60 s measurements

Measurement	Sn, µm
1	10.01
2	10.07
3	10.06
4	9.99
5	9.94
6	10.06
7	10.05
8	10.07
9	10.00
10	10.05
Average, µm	10.03
STDEV, µm	0.04

Repeatability of tin coating for 15 s measurements

Non-Destructive XRF for Coating Analysis

Advantages

- Fast, accurate assay
- Intuitive user interface
- Quick & easy report generation
- Secure encrypted data storage
- Lightweight - only 1.5 kg / 3.3lbs, including battery
- Non-destructive
- Measure in-situ
- Analyze hot samples / pipes

Features

- Rh 50kV excitation source
- Automated 4 filter wheel
- High resolution SDD detector
- TITAN Detector Shield™
- 8, 5 or 3mm spot size
- SharpBeam™ Optimized Geometry
- Optional camera
- IP54 rated
- Operating temperature of -10°C to +50°C
- Multiple fields for sample identification
- Data may be stored in internal instrument memory and/or a USB flash drive



Summary

Composition and thickness of coating materials are optimized to help increase the durability and overall lifetime of tools, equipment and parts used in demanding environments. Handheld XRF (HHXRF) is the perfect instrument for point-and-shoot thickness or coating weight measurements for small and large parts or for difficult-to-reach locations in general metal finishing, power equipment, transportation, construction and sports applications.

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