

# ElvaX ProSpector for coating thickness measurement

## Introduction

Measurement of metal coating such as galvanized zinc over steel is an important task for quality and price control in various industries, such metals industry, electronics, and jewelry. Critical requirement to analysis method is indestructibility. ElvaX ProSpector provides non-destructive, fast and accurate coating thickness measurement without any calibration. Just "from the box" you can measure coatings of any metal at any substrate!

## Application

Typical types of coatings are:

- Zinc over iron/steel;
- Chrome over iron/steel;
- Nickel over iron/steel;
- Copper over iron/steel;
- Gold over copper;
- Copper over aluminum;
- Molybdenum over titanium;
- Nickel over copper;
- Any other metal over any base;

## Instrumentation

ElvaX ProSpector is a handheld ED-XRF spectrometer equipped with 40kV rhodium (or tungsten) anode tube and Silicon drift detector (SDD) or PIN detector. ElvaX ProSpector is rugged and light (around 1.5 kg) and provides full-day (8 hours) of constant operations on battery. Device has intuitive user interface and requires very little operation training. Typical measurement screen in Coating thickness mode is shown at Fig. 1.



Figure 1. Measurement screen in Coating thickness testing mode.

## Method

Any sample preparation isn't required for measurement of coating thickness. Coating and substrate materials must be homogeneous for accurate analysis.

ProSpector can analyze coatings without any calibration standards. But if you have very specific type of material or just want to improve results, you can make an adjustment using only one calibration standard!

Typical measurement time is 5 seconds for ProSpector LE (equipped with SDD detector) or 15 second for ProSpector with PIN detector.

## Testing results

Figures 2-5 show the correlation curves between certified thickness and measured by ElvaX ProSpector for Zn/Fe, Ni/Fe, Ag/Cu, Sn/Cu.

This data was approximated with linear function.

$R^2$  is the coefficient of determination which shows how closely lab and XRF results correlate to each other. An ideal correlation would have an  $R^2$  value of 1.

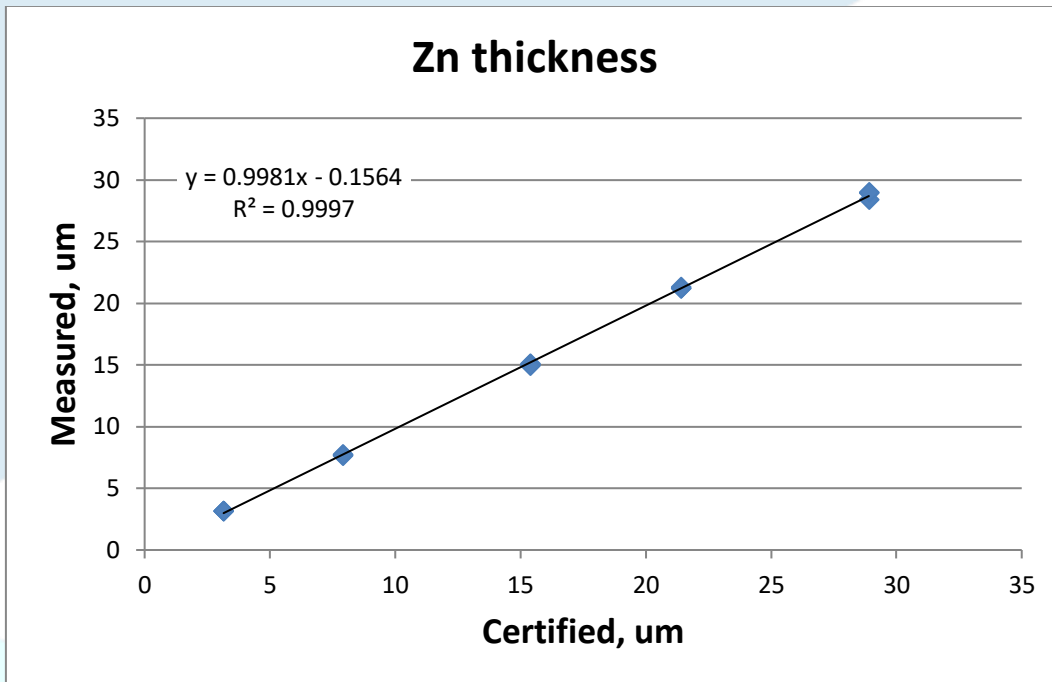


Figure 2. Correlation curve for zinc over iron.

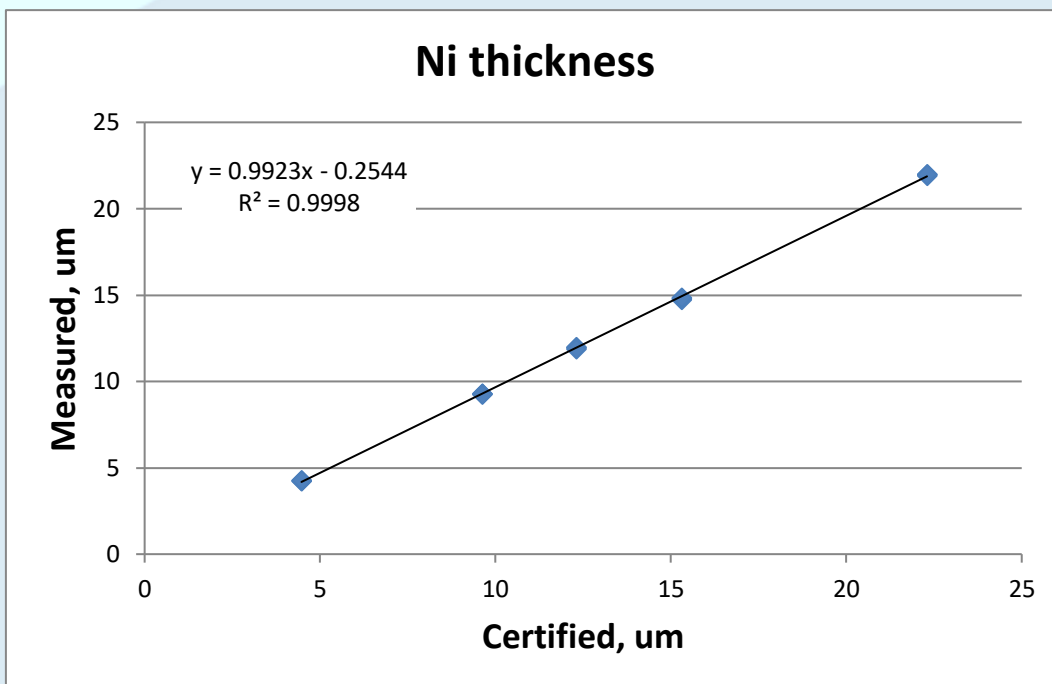


Figure 3. Correlation curve for nickel over iron.

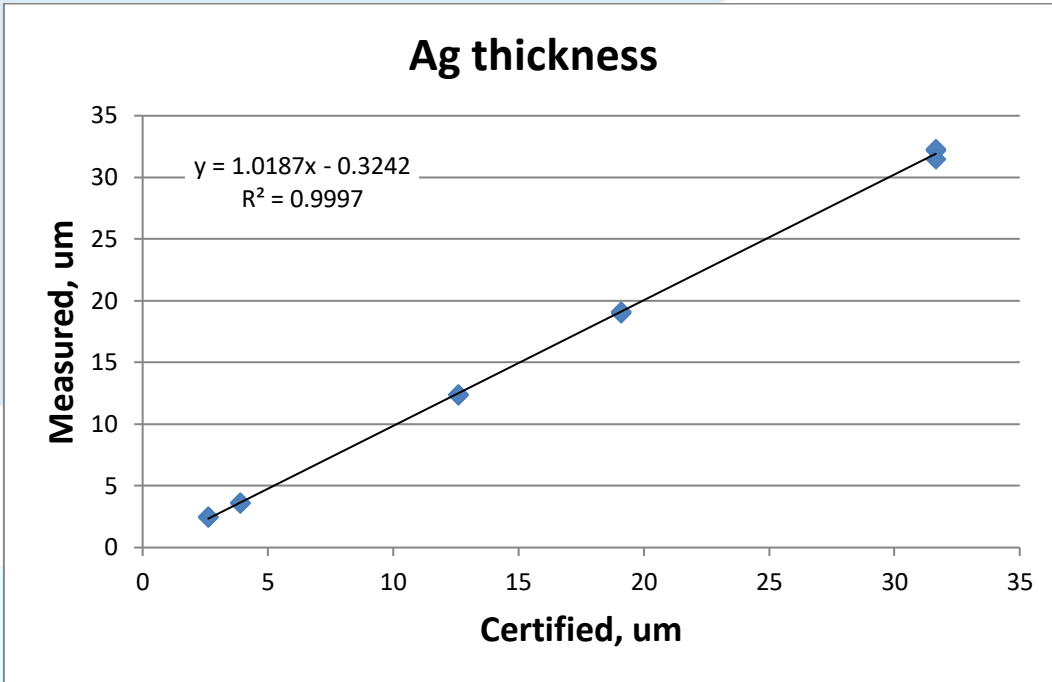


Figure 4. Correlation curve for silver over copper.

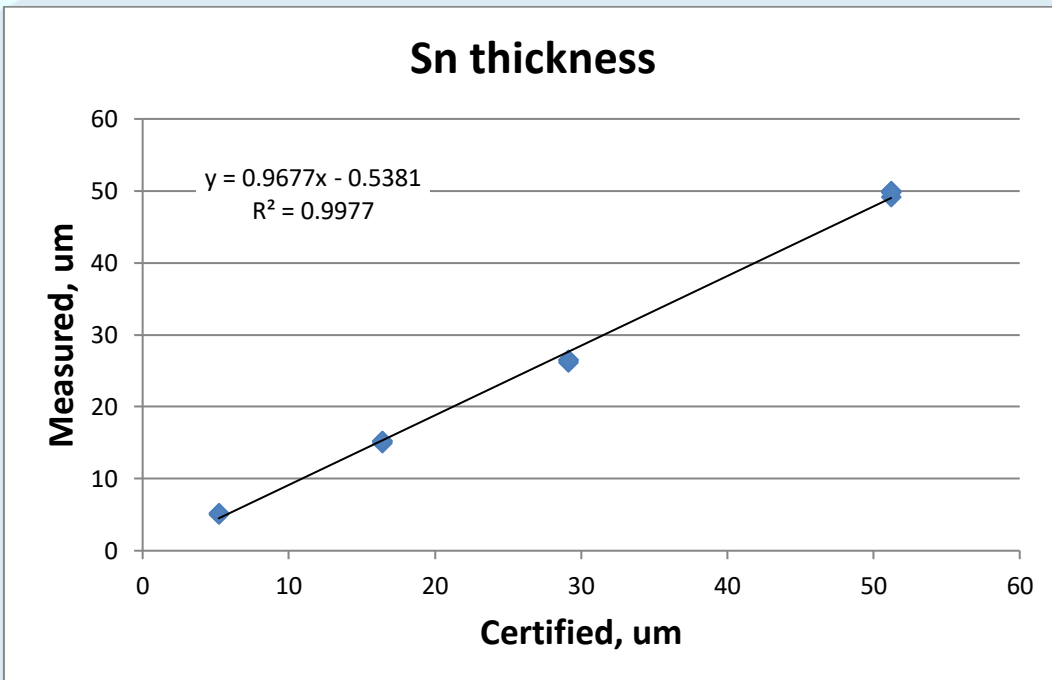


Figure 5. Correlation curve for tin over copper.

Repeatability test was made to demonstrate the precision of the instrument. One certified sample of zinc 15.4um coating over steel was measured 10 times for 5 seconds each time. Average thickness, absolute and relative standard deviation was calculated. Repeatability test results are demonstrated at table 1.

<b>measure #</b>	<b>Zn thickness, um</b>
<b>1</b>	15.45
<b>2</b>	15.37
<b>3</b>	15.5
<b>4</b>	15.31
<b>5</b>	15.31
<b>6</b>	15.37
<b>7</b>	15.42
<b>8</b>	15.48
<b>9</b>	15.31
<b>10</b>	15.37
<b>Average</b>	<b>15.389</b>
<b>Std Dev</b>	<b>0.059</b>
<b>% rsd</b>	<b>0.383</b>

*Table 1. Repeatability test for Zn/Fe 15.4 um.*

## Conclusions

Obtained results indicate a good correlation between certified and measured thickness values for various types of coatings. Because of excellent precision, non-destructive testing, easy and fast operation and no need to calibration ProSpector is an ideal tool for incoming, at line and final quality control in electronics industry, metallurgy, jewelry, aerospace market.