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JEWELRY LAB

ELVAX JEWELRY LAB IN PRECIOUS METALS ANALYSIS

INTRODUCTION

Accurate testing of precious metals is a critical task at all times because of high price of those metals. Even low change of gold concentration leads to significant change of product cost. Also non-destructive analysis is a most important requirement to testing method.

ElvaX Jewelry Lab spectrometer is an ideal instrument for precious metals analysis due to its excellent precision, non-destructive testing and high productivity. Jewelry Lab provides reliable results at every stage of the precious metals life cycle (from the manufacturing stage to finished product to the recycling).

APPLICATION

ElvaX Jewelry Lab solves a wide range of precious metals industry tasks:

- ✔ Gold karat classification of jewelry on the small spot (down to 1 mm spot diameter);
- ✔ Analysis of gold alloys;
- ✔ Analysis of silver alloys;
- ✔ Analysis of platinum and palladium alloys;
- ✔ Identification of gold, silver, platinum and palladium in dental alloys;
- ✔ Detection of gold plating. Jewelry Lab detects possible gold plating or coating during composition analysis. If any plating or coating is possible, that alert message will be displayed, as demonstrated at figure 1.

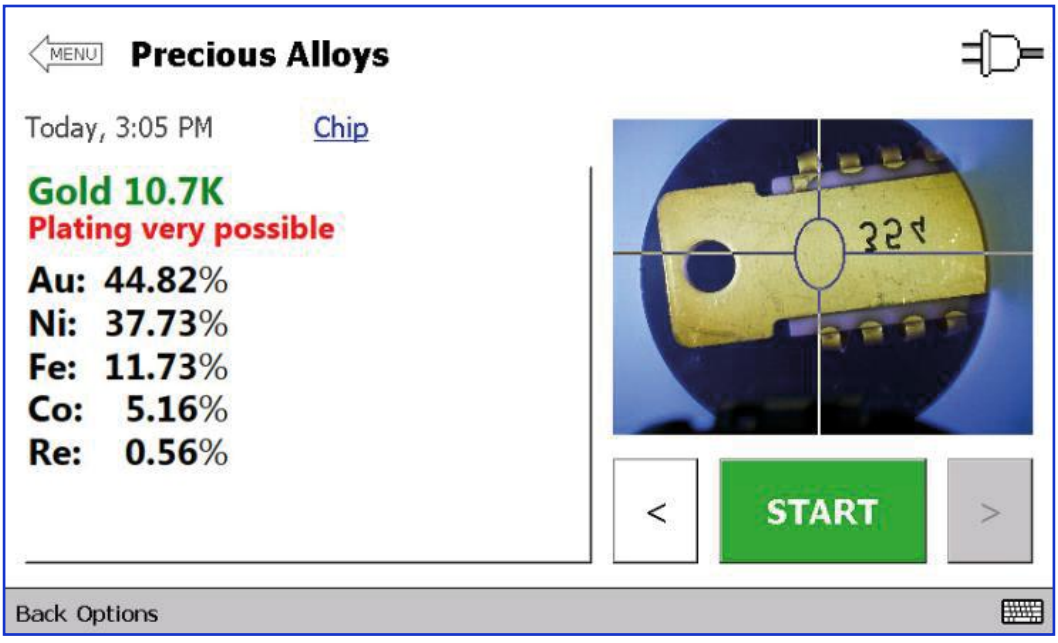

Figure 1. Detection of plating on a chip

APPLICATION

ElvaX Jewelry Lab solves a wide range of precious metals industry tasks:

ElvaX Jewelry Lab is an energy dispersive x-ray fluorescence spectrometer. It equipped with 40 kV x-ray tube with W anode and PIN or SDD detector. Silicon drift detector (SDD) provides more fast and precise analysis of jewelry than PIN detector.

Instrument has an integrated camera and different spot size collimation for focused analysis of small samples. Jewelry Lab can be equipped with up to 6 different spot size collimators, and it can be changed by a two taps on the touch screen. X-ray spot size and location is shown directly at camera view screen. So, the operator sees where the analysis spot is focused, as demonstrated at figure 2.

ElvaX Jewelry Lab can be powered by a battery for on-road analysis.

Software interface is very simple and requires minimal operator training.

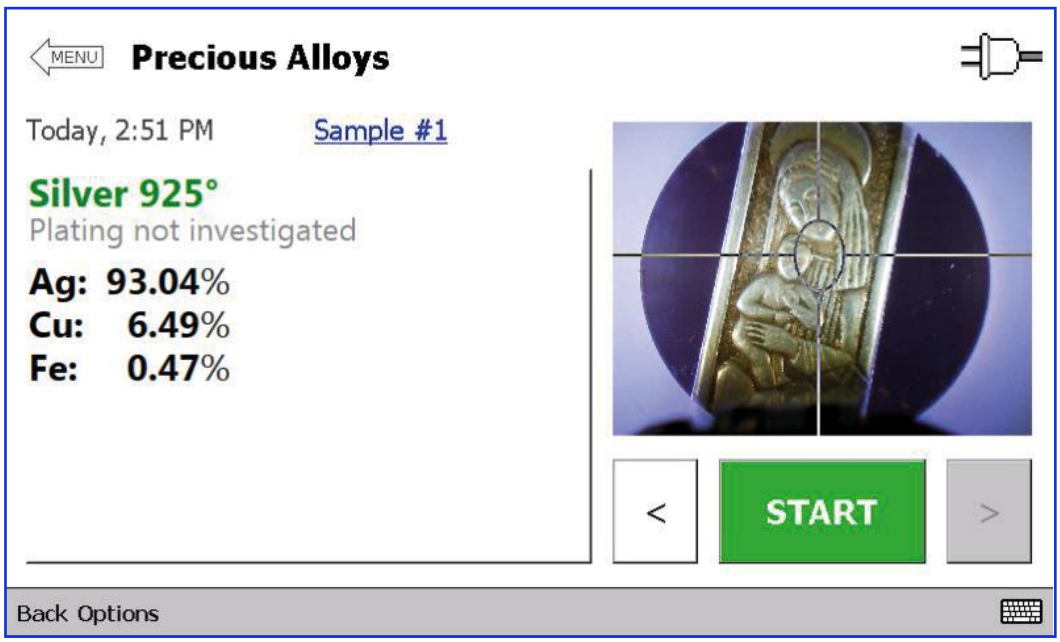

Figure 2. Measurement screen of ElvaX Jewelry Lab

METHOD

ElvaX Jewelry Lab has standardless fundamental parameters calibration with automatically adjustment for different precious alloys (gold, silver, platinum).

Fifteen precious alloy samples and fourteen platinum-palladium alloy samples were measured for this application note. Concentration of gold, silver, copper and platinum, palladium was monitored.

Beam parameters for precious alloys analysis is a 35 kV anode voltage with Ti400 primary beam filters. Measurement time was 30 second for ElvaX Jewelry Lab with PIN detector and 10 second for device with SDD detector.

TESTING RESULTS

Figures 4–6 show the correlation curves between certified concentrations and measured by ElvaX Jewelry Lab for gold, silver and copper in precious alloys.

Figures 7–8 shows correlation curves for platinum and palladium in platinum-palladium alloys. 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.

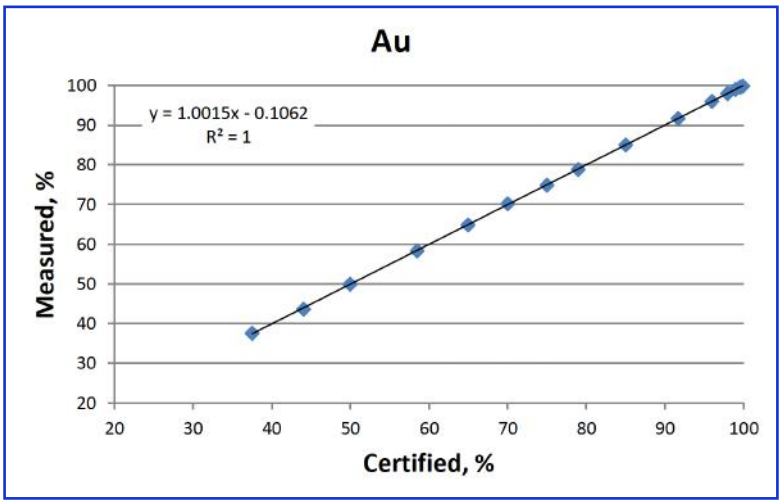

Figure 4. Correlation curve for gold

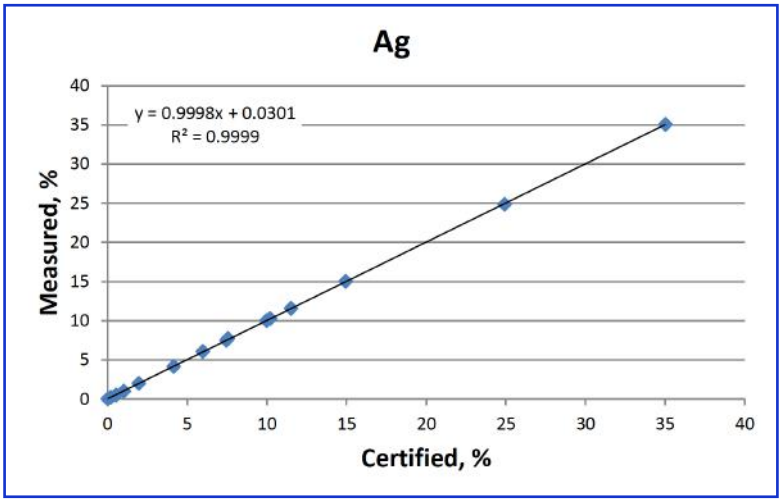

Figure 5. Correlation curve for silver

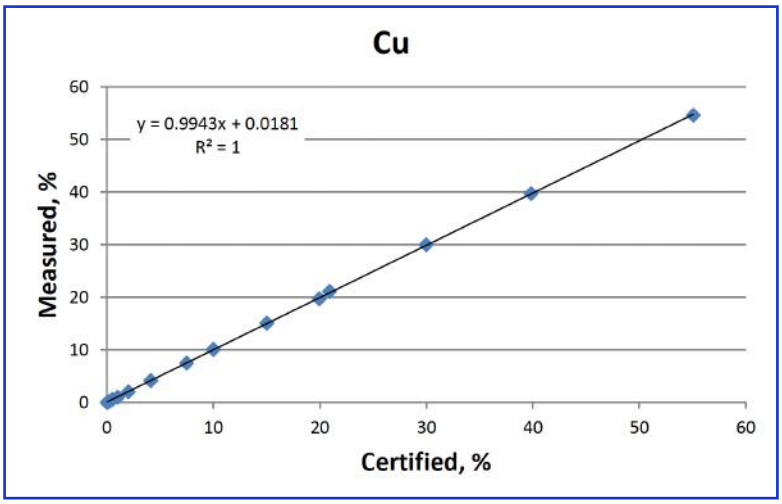

Figure 6. Correlation curve for copper

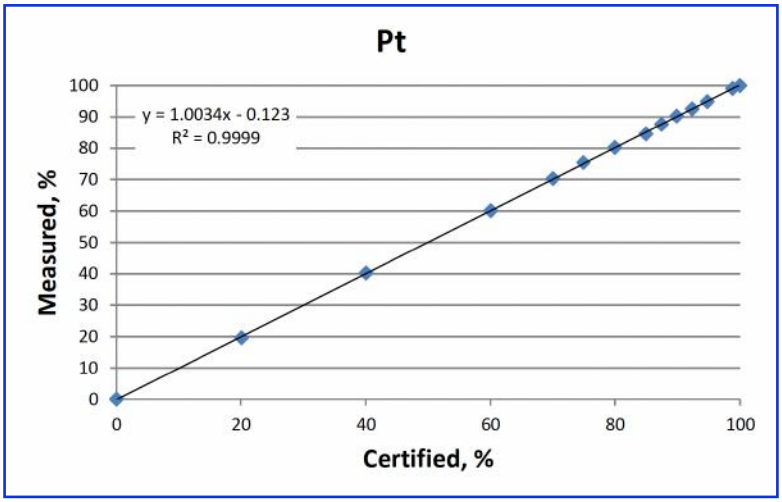

Figure 7. Correlation curve for platinum

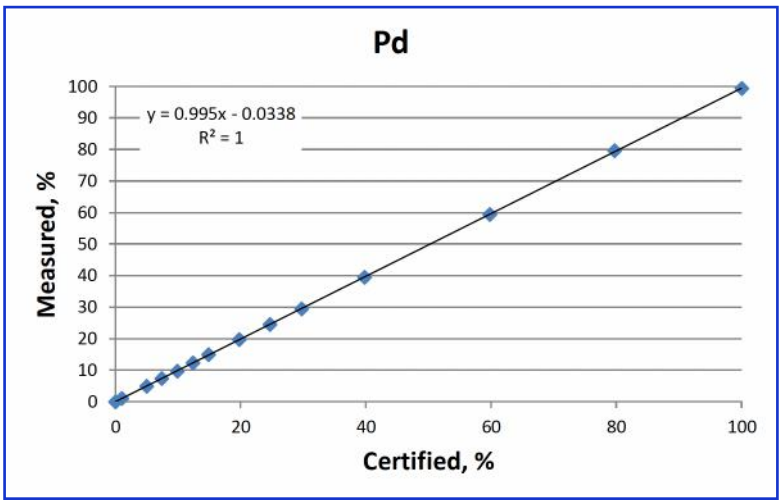

Figure 8. Correlation curve for palladium

Obtained results indicate a good correlation between lab and measured concentration values. Repeatability test was made to demonstrate the precision of the instrument. One sample of Gold 585° was measured 10 times for 30 seconds each time. Average concentration, absolute and relative standard deviation was calculated. Repeatability test for Gold 585° is demonstrated at table 2.

measure #	Au, %	Ag, %	Cu, %
1	58.9	8.06	33.03
2	58.89	8.05	33.06
3	58.87	8.07	33.05
4	58.71	8.06	33.22
5	58.96	8.08	32.96
6	58.87	8.05	33.06
7	58.87	8.03	33.09
8	58.83	8.03	33.13
9	58.85	8.07	33.07
10	58.87	8.05	33.05
Average	**58.862**	**8.055**	**33.072**
Std Dev	**0.039**	**0.013**	**0.045**
% RSD	**0.066**	**0.161**	**0.136**

Table 2. Repeatability test on Gold 585°

CONCLUSIONS

The testing results demonstrate an excellent precision of ElvaX Jewelry Lab in precious metal analysis. Also, ElvaX Jewelry Lab with compact battery is a fully portable device, so you can bring it with you everywhere you want! Fast and accurate measurements with ability to detect gold plating and coating make Jewelry Lab a money saving tool for various businesses, such as jewelry factories, banks, museums, state institutes and other.

Speed Accuracy Stability

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