

Adding Value to the Numismatic Profession with Portable XRF

Introduction

The word Numismatics comes from Latin and means the study or collections of coins, tokens, paper money, and sometimes related objects (such as medals)¹. When discussing the value of coins it is important to distinguish between the bullion value of a coin — which represents the coin's value based on its precious metal content, as opposed to its numismatic value. Coins with numismatic value (“numismatic coins”), are collectible coins valued for their age and rarity rather than, or in addition to their precious metal content. Numismatic coins are sold to and traded among collectors, who may be interested in them for their historical, cultural, or investment value. They may be purchased from wholesalers, national and local retail outlets and brokers, and certification labs.

Application

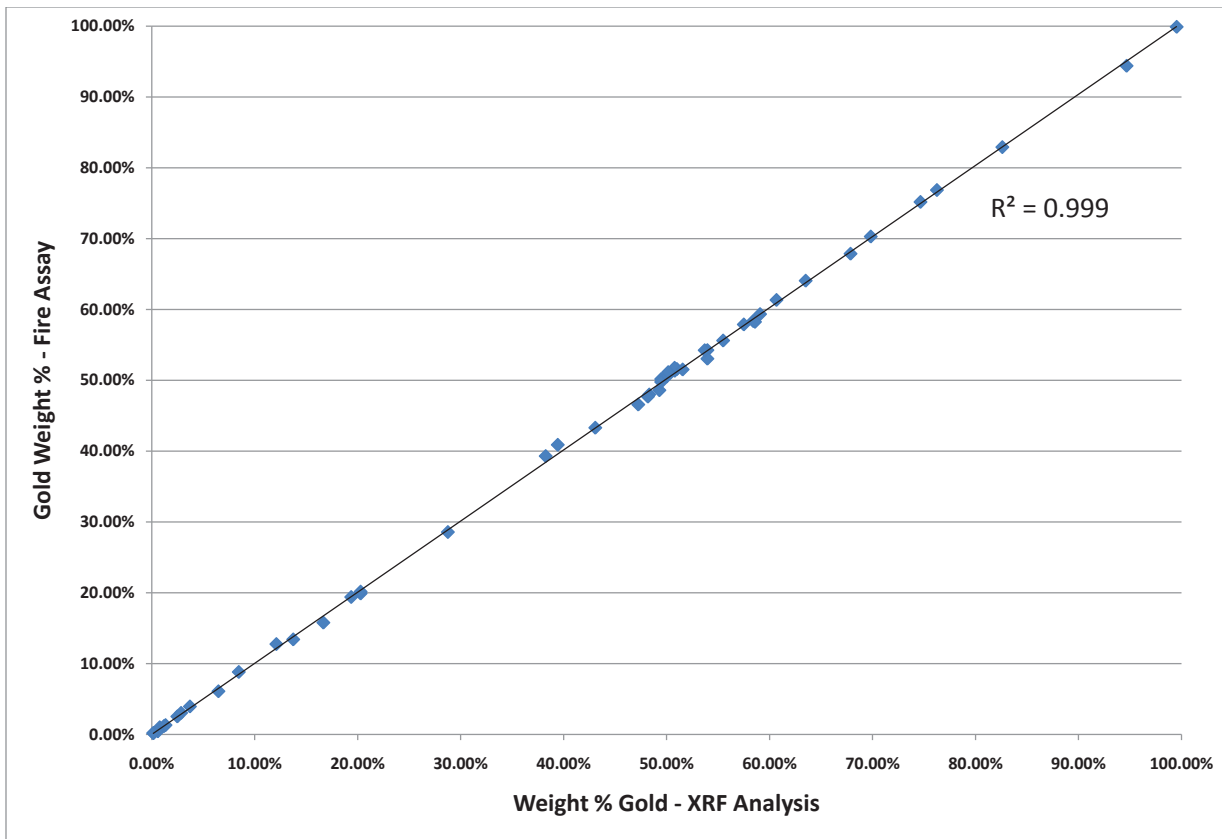
There have been several interesting developments and trends taking place in the world of numismatics, unfortunately, not all of them positive. In recent years counterfeiting has become a pervasive issue in the numismatics marketplace. Counterfeiters are becoming so skilled at replicating the weight, appearance, and strike cleanliness of real coins that high quality fakes can easily be passed off as genuine products. The numismatic market has become risky for investors who may be dealing with untrained brokers, lacking in advanced analytical technologies, or simply unscrupulous.

As a result of increased fraudulent activities we may see the numismatic market become more regulated in response to numerous consumer complaints about counterfeit coin scams. The recently enacted Minnesota Senate Bill 382², for example, calls for numismatics dealers to disclose in writing the exact precious metal content of the coins they sell, with penalties for failing to do so, or for misleading the buyer about the composition of the coins. Dealers will also face consequences for misrepresenting their qualifications to evaluate coins, and for failing to comply with agreed upon terms of sale. If the Minnesota law proves successful, other states will likely



follow suit. Furthermore, numismatics are more often being promoted as an investment rather than collector's items, which may eventually lead to government oversight of the bullion coin market in a manner similar to the stock and bond markets. Such industry shifts point to an increasing need for highly sophisticated analytical technologies to verify the precious metal content of numismatics.

Coin collectors and dealers utilize various methods to analyze their coins, including analytical and non-analytical methods. Non analytical methods involve examining the overall presentation of the coin with simple tools such as a loupe or a magnifying glass. The mint year, any surface alterations, special marks, visible damages will often provide information regarding the general condition of the coin and its authenticity. Other non-analytical testing methods include a ping test, in which the coin is struck with a piece of metal; based on the sound reflected, information can be ascertained as to whether a coin is alloyed or consists of a high concentration of gold or silver (the pure, or near-pure gold will make a dull, non-lasting sound, whereas pure silver produces a sustained ring).



Correlation of Niton XRF to fire assay analysis for gold (Au).

Analytical testing methods include the usage of electrical conductivity devices for gold content measurements. These devices take advantage of the fact that gold is an excellent electrical conductor, and therefore measuring the electrical conductivity of a coin can provide information regarding its precious metal content. This method is typically restricted to the measurement of just a few metals, typically Au (gold) and Pt (platinum). Unfortunately, the Ag (silver) content - which is of high interest to numismatics professionals - cannot be detected by electrical conductivity testers, nor can they provide clear indication of the presence of any alloying metals such as copper or zinc. So typically they provide only qualitative results. These devices are also prone to false readings due to cross-contaminations of the testing probes.

Acid tests are often used to determine the Au karat-value of a coin. Acid tests, by their nature, are qualitative and have limited accuracy. The tests work by applying a series of acids to determine specific karat value ranges, namely 10k, 14k, 18k, and 22k. Based on chemical reactions that take place, or the lack of thereof, the user may conclude that the karat value of a coin or jewelry item lies within a certain range, e.g., “above 14k and below 18k”. What the test does not reveal is the actual gold concentration, the existence and concentration of other precious metals or alloying elements, or any indication of gold plating. The acid test is also destructive and by no means is acceptable when it comes to evaluating high-value numismatic coins. The acids used are corrosive and require special protection.

XRF in Numismatic Assessment

Regardless of the method used to evaluate coins, there is a great value in avoiding any damage to a collectable coin as this may diminish its value by thousands of dollars in certain cases. X-ray fluorescence (XRF) instrumentation such as the Thermo Scientific Niton DXL and Niton XL2 XRF precious metal analyzers provide a fast, accurate, and most importantly, nondestructive alternative for assessing the metal composition of coins, and are currently used by numismatic professionals.





We will take a look at a few examples and see how this powerful tool can be used to detect numismatic fraud and increase the operational speed and efficiency for coin collectors and dealers:

Verification of Elemental Composition – Many coin series are characterized by a unique elemental signature, meaning that the amount and type of certain elements are clearly defined. Any deviation from this composition would indicate fraud. As an example, Canadian dimes and quarters have well-defined compositions. In the year 1968 the composition changed from a 50% Ag (silver) / 50% Ni (nickel) to a 99% Ni composition. Under normal circumstances, the minting year would have served as a reliable indication for the composition, however, in this case, the composition-change occurred in mid year. Given the similar appearance of the two coins, this implies that collectors have no means to assign a clear composition to coins that were minted in that year. The value difference between the two compositions is \$0.76³. With the help of portable XRF technology, the precious metal content can be reliably quantified within seconds.

Bulk Analysis of Coins- Coin dealers will frequently examine coins in bulk quantities. The coins are often delivered to the shop in wraps or plastic bags and transactions have to be concluded quickly. Analyzing each and every coin by examining its mint year can be a tedious, eye-constraining, distracting, and time-consuming task. With the help of portable XRF analyzer, this task can be reduced to a fraction of the time — without having to remove the coins from the wrappers or bags in which they were delivered.

Gold Plating Detection – Certain gold coins come in various purity levels. The purity level can vary between 14K and 22K, and, in addition, they can come in Au-plated or unplated versions. While the unaided eye can distinguish between a medium-karat (e.g., 14K) and a high-karat coin (22K), it is difficult to distinguish between a high-karat and a gold-plated coin. Destructive tests are highly discouraged, as they will significantly diminish the value of the coin. Thanks to Thermo Fisher Scientific's patented AuDIT™ gold-plating detection technology, any

gold plating or the lack of thereof can be reliably determined in a matter of seconds.

Fraud Detection – Fake coins are flooding the markets! The methods used by counterfeiters are becoming more and more advanced. A common method to fake coins is to apply a silver plating to a non-silver substrate, in an effort to imitate a solid silver coin. Portable XRF can easily detect the composition of the coin revealing any deviations from the original coin's known composition. A demonstration by a numismatic expert in a popular YouTube video demonstrates the prowess of our Niton XL2 precious metal analyzer in the process of detecting such fraudulent coins⁴.

Direct Measurement of Encapsulated Coins – Valuable coins are often protected by thin foils or encapsulated in plastic slabs, such as the one shown in the photo at the upper left of the page. This is done in order to retain the coin's value; removing the coin from its protective cover diminishes its value instantly (it's like driving a brand new car out of the dealership minutes after the purchase, the car's value drops as soon as it leaves the dealership). Counterfeiters will often take advantage of this and enclose a fake coin in a protective sheet, assuming and hoping that the buyer is not likely to open it. Portable XRF can easily detect the true composition of the coin by testing through thin foil covers, and provide a very good indication of the coin's composition even in the case of thicker plastic slabs.

Measuring a silver coin twice using the Thermo Scientific Niton DXL, once through a protective foil, and once without the foil, showed the following results⁵:

Element	Without Plastic Foil	With Plastic Foil
Ag	88.3 ± 1.1	87.4 ± 1.1
Cu	11.7 ± 0.4	12.5 ± 0.4





Conclusion

X-ray fluorescence (XRF) analyzers provide a fast, accurate, nondestructive method to aid in assessing the value of collectable coins. XRF analyzers help coin dealers detect fraud and increase their overall operational efficiency because they quickly provide the exact karat weight and percentages of all precious metals and alloying elements within an item – easily identifying non-standard, under-karated, and even advanced counterfeit material that acid testing is incapable of differentiating. What's more, our AuDIT technology helps identify gold-plated items that may go undetected by more traditional test methods.

Additional Information/Resources:

- American Numismatic Society – www.numismatics.org
- American Numismatic Association – www.money.org
- Independent Coin Graders (“ICG”) - <http://www.icgcoin.com/>
- ANACS (grading services) - <http://www.anacs.com/Default.aspx>.
- New Minnesota Bill - <http://legiscan.com/MN/text/SF382/id/798143>
- www.coinflation.com/

¹ Merriam Webster Online Dictionary

² <http://legiscan.com/MN/text/SF382/id/798143>

³ <http://www.coinflation.com/>, August 2013.

⁴ <http://goldsilver.com/video/special-report-how-to-avoid-fake-silver-and-counterfeit-gold-products/>

⁵ Measurement time: 10s, average from three measurements, small spot activated

thermoscientific.com/niton

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