

Specifics of the Main Component Calculation when Assaying Fine Precious Metals

D. I. Rabchun, Acting Head of the Analytical Center, M. Chizhnik, Quality Manager of the Analytical Center & M. Shubakova, Head Engineer of Spectroscopy Analysis Laboratory.
JSC Krastsvetmet, Russia

+7 391 259 3333, info@krastsvetmet.ru

Krastsvetmet is one of the world's largest producers of precious metals and products made thereof. The company refines all 8 precious metals on industrial scale and processes all types of mineral and secondary raw materials. Krastsvetmet is in charge of administering the Platinum Group Metals Technical Committee TC 102 secretariat, which aim is development and revision of Russian national and interstate platinum metal standards, including assay methods.

All requirements for fine metals finished products produced by Krastsvetmet, including the list of components to be analysed, are covered by the Technical Specifications. The Assay methods implemented to analyse the components have the status of either State Standards (GOST), or certified measurement techniques with metrological characteristics not lower than GOST ones, which set up determination ranges and certified reference materials to ensure the accuracy of the obtained results.

The regulatory document that prescribes in Russian Federation the procedure of main component calculation is GOST R 52599-2006 "Precious Metals and Their Alloys. General Requirements for Assay Methods". According to Clauses 8.7–8.9 of the above mentioned GOST:

1. When assaying fine metals, the content of the main component is determined as the difference between 100% and the sum of the mass fractions of the determined impurities.
2. If the content of an impurity element in the sample is below the lower determination limit for the element as set forth in the analytical technique, the lower determination limit is taken as the content of the element and is used in calculation of the main component.
3. The total amount of impurities is deducted from 100%, the obtained value is rounded to the decimal place to which the content of the main component is specified in the regulatory document by omitting the subsequent decimal places, e.g. $100\% - 0.016\% = 99.984\% = 99.98\%$

Other countries have different requirements for fine precious metals, procedure of the main component calculation, and presentation of the assaying results. Table 1 provides an example of discrepancies in the results of fine rhodium assaying:

Laboratory	Mass loss upon ignition, %	Rhodium, %
Supplier	0.04	99.99
Krastsvetmet	0.04	99.94

Table 1—Results of fine rhodium assaying by the Supplier and by Krastsvetmet

According to the Table, the main reason of discrepancies in rhodium content are differences in the requirements to fine rhodium. Thus, in the Russian Federation, the loss upon ignition is generally taken into account when calculating the main component in accordance with GOST 12342-2015 "Fine Rhodium Powder. Technical Specifications". Also, the majority of impurities in the certificate for this lot of material provided by the Supplier were listed as "ND" (not detected), and for one of the components the result of assaying was given as "0".

Different requirements for materials, procedures of main component calculation, presentation of the assaying results cause financial and manufacturing challenges in international flows of precious metals.