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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 18043-2013

Replacing GB/T 18043-2008

**Jewellery - Determination of precious metal content - X-ray
fluorescence spectrometry method**

首饰 贵金属含量的测定 X射线荧光光谱法

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Foreword

This Standard was drafted according to the rules specified in GB/T 1.1-2009. This Standard replaces the GB/T18043-2008 Jewellery - Determination of Precious Metal Content - Method Using X-Ray Fluorescence Spectrometry. There are mainly the following changes, compared with the GB/T 18043-2008. - Revise the application scope. Clearly define this test method as the screening test; - Add the terms; - In detail, describe the basic principles of X-ray fluorescence spectrometry. Clearly state the application scope of this method in terms of working principles; - Improve the resolution requirements of this method TO X-ray fluorescence spectrometer; - Refine the test process. Clarify the operation steps of this method; - Add the content description and illustration for screening and determination in accordance with measurement result's range. - Add the description of limitations of the method; - Add Annex A, B and C. This Standard was proposed by China National Light Industry Council. This Standard shall be under the jurisdiction of National Technical Committee (SAC/TC 256) on Jewellery of Standardization Administration of China. Drafting organizations of this Standard. National Gold and Silver Products Quality Supervision and Testing Center (Nanjing), National Jewellery Quality Supervision and Inspection Center, China Institute of Metrology, National Gemstone Quality Supervision and Testing Center, National Gold and Silver Products Quality Supervision and Testing Center (Shanghai), National Gold Diamond Products Quality Supervision and Testing Center, Tianjin Product Quality Supervision and Testing Technology Research Institute, and Chengdu Product Quality Supervision and Testing Institute. The main drafters of this Standard. Yang Pei, Yang

Su, Zhou Tao, Duan Tiyu, Li Suqing Ke Jie, Xie Qiyao, Cheng Youfa, Cao Weiyu, Shen Feng, Wang Donghui, Shen Meidong, Fang Mingshu, Liu Huafeng, Wang Chunsheng, Li Yukun, Li Guogui, and Li Wujun. The previous editions replaced by this Standard are as follows: - GB/T 18043-2000, GB/T 18043-2008.

The test laboratory that uses this Standard is required to develop implementation details such as - personnel, facilities and environmental conditions, equipment (including working reference materials), and uncertainty evaluation. During use of this Standard, it is necessary to refer to Annex A, Annex B, and Annex C to perform sample testing, data processing, and result determination. Jewellery - Determination of precious metal content - Method using X-Ray fluorescence spectrometry

1 Scope

China's national method for determining how much gold, silver, platinum or palladium a piece of jewellery contains, without destroying it. It specifies the method and requirements for applying X-ray fluorescence spectrometry to the determination of precious metal content in jewellery, applies to the qualitative analysis of jewellery and other art objects, and applies to the screening of precious metal content in them. The word screening in the scope is the most important word in the document. XRF is the only practical way to test a finished article without cutting it: the surface is irradiated, the characteristic fluorescence of each element is counted, and the composition follows within a minute or two. That makes it the instrument every hallmarking office, pawnbroker and customs laboratory uses. But it measures a surface layer only a few micrometres deep, and jewellery is very often not homogeneous. A gold-plated base metal ring reads as high-carat gold. A piece with a heavy rhodium flash reads wrong. Solder at a joint has a different fineness from the body. And a deliberately depleted surface - a piece treated so that the outer layer is richer in gold than the bulk - is an old fraud that XRF is specifically vulnerable to. The standard therefore sets out the principle and the instrumentation, the test procedure and the requirements for calibration standards, and then devotes explicit chapters to the factors that affect the result and to the limitations of the method: surface condition and preparation, coatings and plating, geometry and curvature, the size of the analysed spot, and inhomogeneity of the article. The processing of the results and three annexes complete it. Issued on 17 December 2013 and in force since 1 March 2014, it replaces GB/T 18043-2008.

This Standard specifies the methods and requirements for applying X-ray fluorescence spectrometry to determine the precious metal content in jewellery. This Standard applies to qualitative analysis for jewellery and other art-ware. And it also applies to the screening test of precious metal content (gold, silver, platinum, and palladium) in jewellery and other art-ware.

2 Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all the modifications (Including all corrections) or revisions made thereafter shall be applicable to this document.

GB 11887 Jewellery - Fineness of precious metal alloys and designation

3 Terms and definitions

For the purpose of this document, the following terms and definitions shall apply.

3.1 Screening A kind of analysis method that preliminarily quantifies the element's content in the substance to be tested.

4 Method and principle

Through X-ray excitation (penetration thickness is typically a few microns to tens of microns), the elements on surface layer of jewellery can emit characteristic X-ray fluorescence spectrum. Perform the qualitative analysis according to the characteristic spectrum lines (energy or wavelength).

5.1 X-ray fluorescence spectrometer. Peak of manganese at

5.89 keV energy position - its resolution is better than 170 eV.

6 Test method

6.1 Instrument calibration Calibration shall be conducted periodically in accordance with the specific requirements for instruments.

6.3 Test method

6.3.1 Check sample varieties, imprinting, appearance and other properties.

6.3.2 Conduct qualitative analysis to determine the composition of principal elements and impurity elements.

6.3.3 According to the results of qualitative analysis, select the reference materials whose purity level basically matches with the impurity components'. Each reference materials shall be measured for three times at least. Obtain the average value after repeated measurements. Use the standard values and the corresponding average values of each element's content AS the parameters. Draw the correction curves. Obtain the linear equation of the correction curve.

7 Factors that affect the measurement results

Due to the special condition of the jewellery products, and under the restriction of the

method and principle, when using this Method, the testing personnel shall understand and be familiar with the following factors that will affect the measurement results (such affecting factors may have a significant influence on the collection of the characteristic spectral line's intensity under the different conditions. It may even cause the erroneous judgment).

8 Processing of measurement results

8.1 Considering the various factors in Chapter 7, the testing laboratory shall evaluate the uncertainty on the measurement results (the evaluation method shall reference to Annex B).

8.2 According to the range of measurement results, conduct the screening and determining.

8.3 The determination results can provide the testing qualitative conclusion. Or it can provide the corresponding purity range according to GB 11887.

9 Limitations

9.1 Because there are differences on the aspects of component, shape etc. between reference materials and the tested sample, the range of test elements is uncertain.

9.2 If there is dispute of the testing result, it shall be tested in accordance with the arbitration method as stipulated in GB 11887.

9.3 For the samples containing solder and of which the nominal value of the precious metal purity is 999 per mille, the measured value shall consider the solder's proportion in sample. Weighted calculation shall be conducted when calculating the specific measurement results.