

Determination of Silver in Copper Concentrate by Atomic Absorption Spectrometry

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Abstract: Atomic absorption spectrometry has the characteristics of very high accuracy. In order to find out the factors that affect the detection, it is necessary to analyze the silver content in copper concentrate, which is conducive to the detection of the real existence of silver and other elements in copper concentrate. This paper briefly describes the atomic absorption spectrometry method of silver in copper concentrate.

Keywords: Copper concentrate; Atomic absorption spectrum; Silver quantity

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1 Introduction

With the development of the times and the continuous advancement of the modernization process, China's science and technology are constantly maturing, and the influencing factors of silver content in copper concentrate under the method of atomic absorption spectrometry are analyzed and detected more accurately with the maturity of science and technology. In this paper, through the analysis of each link of the atomic absorption spectrum analysis of silver in copper concentrate, the atomic absorption spectrum determination method of silver in copper concentrate is summarized, and its influencing factors and solutions are explored.

2 Brief Introduction of Microwave Digestion-Flame Atomic Absorption Spectrometry

2.1 Atomic Absorption Spectrometry Method

Flame absorption spectrometry, also known as FAAS method, is a common method to determine the silver content in minerals. At present, the national standard method is generally adopted to measure and inspect the silver contained in imported and exported copper concentrates. The copper concentrate samples are melted by aqua regia mixed with nitric acid and perchloric acid and then

determined by atomic absorption spectrometry. In the determination, perchloric acid has a high influence ability in the dissolution process, which brings great errors to the determination process, so it is necessary to determine by atomic absorption spectrometry after evaporating perchloric acid. Because microwave digestion is different from other methods, it produces less pollution, uncomplicated test links, less acid consumption and faster speed, so this method is often used in China's metal mineral analysis in recent years ^[1].

2.2 Advantages of Atomic Absorption Spectroscopy

Atomic absorption spectrometry (AAS), as a new analysis and detection method of mineral materials adopted in China in recent years, represents the high maturity and development of modern science and technology. Using AAS to detect a trace mineral in mineral materials can improve the mineral utilization rate and bring greater profits to related industries. Some copper concentrates usually contain a small amount of silver. Effective use of atomic absorption spectrometry can reduce other influences during processing, effectively detect the specific content of silver in copper concentrates, and reduce mineral deterioration and volatilization during processing. Atomic absorption spectrometry needs to be combined with the specific configuration of silver in copper concentrate and

standard determination requirements, which is conducive to reducing errors and ensuring accurate analysis results of silver content in copper concentrate.

3 Atomic Absorption Spectrum Experiment

3.1 Experimental Instruments and Reagents

Generally, atomic absorption spectrometer, silver hollow cathode lamp and microwave digestion instrument are used in the experiment. However, when the reagents are convenient, it is necessary to prepare silver standard reserve solution according to the national standard. When preparing aqua regia, a certain volume fraction of concentrated nitric acid, hydrochloric acid and perchloric acid should be prepared and matched according to the corresponding experimental process and sequence. In addition, the experimental water is secondary deionized water. During the working process of the instrument, it is necessary to set its parameters, such as analysis wavelength, deuterium lamp deduction background, acetylene gas flow rate, air flow rate, burner height, lamp current, slit width and so on, in the required range of test ^[2].

3.2 Test Method

First, weigh a certain amount of copper concentrate samples and add them into tetrafluoroethylene tanks. Pay attention to the fact that this process needs an accuracy of 1/10,000, so it needs a high-precision electronic scale. Add the prepared aqua regia into the tetrafluoroethylene tank to make it react violently. When the reaction stops, it is necessary to cover the tetrafluoroethylene tank with a plug. Turn on the microwave digestion instrument, put the reflected tetrafluoroethylene reaction tank into it, and set the corresponding microwave digestion program. Generally speaking, there are three levels of microwave digestion program. The first level is to set the power of microwave digestion instrument and standard target temperature, and set its heating time and holding time. The second and third levels are to keep the power of microwave digestion instrument unchanged, and increase the target temperature and holding time twice. It should be noted that the third level also needs to reduce the heating time. After heating up and digestion, it is necessary to wait for the solution to cool down, transfer the solution to a volumetric flask, dilute it, and let it stand for determination.

3.3 Digestion System

When studying copper concentrate, the temperature-rising digestion program of microwave digestion instrument is set, and the digestion effects under various dissolution

systems are compared (here, various dissolution systems refer to different proportions of hydrochloric acid, nitric acid and hydrogen peroxide). By using X-ray diffractometer, the residual black residue and white precipitate in the above dissolution systems are analyzed, and referring to relevant experimental data, it can be seen that the white precipitate is generally silica, while the black residue is copper concentrate that is not completely dissolved, and there are many.

3.4 Determination of Aqua Regia Concentration in Liquid

Because different aqua regia concentrations have different effects on the determination of silver content in copper concentrate, it is necessary to prepare standard silver solution to determine different aqua regia concentrations before the determination. In the process of determination, the absorbance of the solution is determined with reference to the test method, under ideal conditions (that is, assuming that the loss of aqua regia is negligible). By detecting the calibration effects of different volumes of aqua regia, it can be concluded that when the volume fraction of aqua regia is in the range of 4%-15%, its absorbance is basically unchanged ^[3].

3.5 Coexisting Elements

Generally, copper concentrate contains not only copper, silver, iron and other elements. In order to eliminate the interference of other elements on the determination experiment, it is necessary to control the content of coexisting elements. Take a certain amount of copper concentrate samples, and determine the two elements with the highest content of iron and copper, explore the influence of the content of iron and copper on the determination of silver, and analyze the maximum content range of copper and iron. According to the experiment, when the relative error is within 5%, the content of copper and iron has little influence on the determination of silver, which is almost negligible, so copper and iron can not be excluded from the actual determination of silver. As for the influence of other trace elements, because its content is too low, the influence can be ignored.

4. Analysis of Influencing Factors of Atomic Absorption Spectrometry in Concrete Detection

4.1 Sampling of Processing Samples

When detecting by atomic absorption spectrometry, it is necessary to analyze the sampling of processed samples and the specific amount of minerals. Because the silver

content in different samples is different, and the mineral content of each sample is also quite different, in order to reduce the measurement influence caused by the differences between samples, it is necessary to strictly monitor and process the analysis during sampling, accurately analyze and measure the mineral components in the sampled samples and the silver content in the copper concentrate, and screen them. In the process of using the samples, we should abide by the laboratory rules, do not pollute the samples, and increase the mineral salt content of the samples, so as to ensure the accuracy of the determination.

4.2 Influence of Sampling Content

In addition to strict requirements on the sampling process of processed samples, there are corresponding standards for the sampling content, because if the sampling content of each sample is too large, the silver products produced by it will contain large minerals. As mentioned above, although copper and iron have no great influence on the determination process of silver, the content of other elements will also increase after the sample content increases, which will have a great influence on the determination of silver and the processing of silver products, which will not only affect the purification process. Minerals appearing in the process of processing cause inconvenience to the subsequent processing of silver products, and the decomposition and treatment of these minerals need complicated processes, which is not only dangerous, but also costly.

4.3 Preparation before Sampling

Only by making preparations for the sampling of copper concentrate in advance, carrying out rigorous calculation to determine the sampling content and planning the sampling samples, can we ensure that the problems in the sampling process can be avoided in the subsequent sample processing, reduce the failure rate of the experiment, avoid the subsequent potential safety hazards and dangerous factors, and provide higher purity silver for the subsequent processing of silver products. For samples with complex mineral content, it is necessary to remove harmful impurities in the samples by firing, which provides higher safety and stability for purification. In addition, with the development of science and technology, the purification problems caused by impurities have been treated more and more accurately in the utilization of atomic absorption spectrometry. For some copper concentrates with high lead content, it can be reacted with hydrochloric acid until precipitation occurs, and the specific steps should be

carried out in the order of dilute nitric acid-hydrochloric acid-precipitation^[4].

4.4 Instrument Aspect

Because the subsequent silver products need high purity of silver, and the atomic absorption spectrometry method also needs high precision, the use of the instrument is tested after all preparations for processing samples of copper concentrate are completed. The working environment of the instrument must be suitable for the processing of silver products, and the instrument cannot be used under the condition of serious pollution and environmental chaos. The sense of use of the instrument, the precision of purification and the accuracy of detection and analysis must have strict requirements, and must strictly meet the national standards.

5 Conclusion

The above mentioned atomic absorption spectrometry method of silver in copper concentrates is mentioned, because with the development of science and technology and the promulgation of relevant standards, the purification and detection of silver in copper concentrates in China are becoming more and more accurate and perfect, and the research based on a series of problems of processing and test methods will better promote the inspection of silver products in China.

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