

HJ

INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

HJ 694-2014

**Water Quality - Determination of Mercury, Arsenic, Selenium,
Bismuth and Antimony - Atomic Fluorescence Spectrometry**

水质 汞、砷、硒、铋和锑的测定 原子荧光法

(English Translation)

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Foreword

To implement the "Environmental Protection Law of the People's Republic of China" and "Water Pollution Prevention Law of the People's Republic of China", protect the environment, protect human health, and regulate the monitoring methods of mercury, arsenic, selenium, antimony, and bismuth in water, this Standard is formulated.

This Standard specifies the atomic fluorescence spectrometry for determination of mercury, arsenic, selenium, bismuth, and antimony in water.

This Standard is released for the first time.

Annex A of this Standard is informative.

This Standard was formulated by the Department of Science, Technology and Standards of Ministry of Environment Protection.

Main drafting organization of this Standard: Nanjing Environmental Monitoring Center.

Verification organizations of this Standard: Jiangsu Environment Monitoring Center, Jiangsu Physical and Chemical Testing Center, Wuxi Environmental Monitoring Center Station, Changzhou Environmental Monitoring Center, Zhenjiang Environmental Monitoring Center Station, and Taizhou Environmental Monitoring Center.

This Standard was approved by the Ministry of Environmental Protection on March 13, 2014.

This Standard shall be implemented from July 1, 2014.

This Standard shall be interpreted by the Ministry of Environmental Protection.

Water Quality - Determination of Mercury, Arsenic,

Selenium, Bismuth and Antimony -

Atomic Fluorescence Spectrometry

Warning: nitric acid, hydrochloric acid, and perchloric acid have a strong corrosivity and a strong oxidability, so it shall wear protective equipment when operating, so as to avoid contact with skin and clothing. The pretreatment process of all samples shall be carried out in a fume hood.

1 Application scope

This Standard specifies the atomic fluorescence spectrometry for the determination of mercury, arsenic, selenium, bismuth, and antimony in water.

This Standard applies to the determination of soluble [Translator: dissolved-state] and total quantity of mercury, arsenic, selenium, bismuth, and antimony in surface water, groundwater, sewage, and industrial waste water.

According to the method of this Standard, the detection limit of mercury is 0.04µg/L, the determination lower limit of mercury is 0.16µg/L; the detection limit of arsenic is 0.3µg/L, the determination lower limit of arsenic is 1.2µg/L; the detection limit of selenium is 0.4µg/L, the determination lower limit of selenium is 1.6µg/L; the detection limit of bismuth and antimony is 0.2µg/L, the determination lower limit of bismuth is

0.8µg/L.

2 Normative references

This Standard references the following documents or its terms. For undated references, the latest version applies to this Standard.

GB/T 21191 Atomic fluorescence spectrometer

HJ/T 91 Technical specifications requirements for monitoring of surface water and waste water

HJ/T 164 Technical specifications for environmental monitoring of groundwater

HJ 493 Water quality - Technical regulation of the preservation and handling of samples

HJ 494 Water quality - Guidance on sampling techniques

3 Terms and definitions

The following terms and definitions apply to this Standard.

3.1

Soluble mercury, arsenic, selenium, bismuth and antimony

It refers to the content of mercury, arsenic, selenium, bismuth, and antimony determined in the filtrate of the not-acidified sample, after being filtered through the filter membrane with a pore size of 0.45µg.

3.2

Total quantity of mercury, arsenic, selenium, bismuth and antimony

It refers to the content of mercury, arsenic, selenium, bismuth, and antimony determined in the unfiltered sample, after being dissolved.

3.3

Determined elements

It refers to mercury, arsenic, selenium, bismuth, and antimony elements.

4 Principle of the method

The test solution after pretreatment is put into the atomic fluorescence spectrometer; under potassium borohydride (or sodium borohydride)'s reducing effects at acidic conditions, it generates arsine, bismuthine, antimony hydrogen, hydrogen selenide, and mercury atoms; the hydride forms ground-state atoms in argon and hydrogen flames; its ground-state atoms and mercury atoms generate atomic fluorescence by the excitation of the light emitted by element (mercury, arsenic, selenium, bismuth, and antimony) lights; the atomic fluorescence intensity is in direct proportion to the content of determined elements in the sample solution within a certain range.

5.1 The elements in acidic medium, that can react with potassium borohydride and

generate hydride, would affect each other and produce interference; adding thiourea + ascorbic acid solution (6.20) can substantially eliminate the interference.

5.2 Copper and other transition metals that are above a certain concentration may

interfere to the determination; adding thiourea + ascorbic acid solution (6.20) can eliminate most of the interference. Under the experimental conditions of this Standard, samples containing less than 100mg/L of Cu^{2+} , less than 50mg/L of Fe^{2+} , less than 1mg/L of Co^{2+} , less than 10mg/L of Pb^{2+} (5mg/L for selenium), and less than 150mg/L of Mn^{2+} (2mg/L for selenium) do not affect the determination.

5.4 Physical interference elimination. Select two-layer-structure quartz tube atomizer;

with the outer and inner layers filled with argon gas, form a protective outer layer to isolate air, so that the ground-state atom of determined elements do not collide with oxygen and nitrogen in the air, so as to reduce the fluorescence quenching effect on the determination.