



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

GBZ/T 306-2018

Replacing WS/T 37-1996

**Determination of chromium in urine -- Graphite furnace atomic
absorption spectrometric method**

尿中铬的测定 石墨炉原子吸收光谱法

(English Translation)

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Foreword

This standard is formulated in accordance with the Law of the People's Republic this standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces WS/T 37-1996 "Method for the determination of chromium in urine by graphite furnace atomic absorption spectrometry".

Compared with WS/T 37-1996, the main changes are as follows.

- The operating conditions of the instrument are changed to the reference conditions for instrument operation;
- Improved standard formulation and sample handling methods;
- Increased use of matrix modifiers.

This standard was drafted. Jiangsu Provincial Center for Disease Control and Prevention, China Center for Disease Control and Prevention, Occupational Health and Poison Control Institute, Guangdong Provincial Occupational Disease Prevention and Control Institute, Wuxi Municipal Center for Disease Control and Prevention, Nanjing Occupational Disease Prevention and Control Institute.

1 Scope

This standard specifies the determination of chrome graphite furnace atomic absorption spectrometry in urine.

This standard applies to the determination of urinary chromium in occupational contact personnel.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this document.

For undated references, the latest edition (including all amendments) applies to this document.

General rules for biological monitoring of GBZ/T 295 occupational population

3 Principle

A urine sample (hereinafter referred to as a urine sample) is diluted with a mixed solution of magnesium nitrate and nitric acid, and then a graphite furnace atom is used at a wavelength of 357.9 nm.

Determined by absorption spectroscopy.

4 Instruments

4.1

Covered plastic bottle, 100 mL.

4.2

Volumetric flasks, 10 mL, 100 mL, 500 mL, 1000 mL.

4.3

Pipettes, 50 μ L, 200 μ L, 1000 μ L.

4.4

Covered plastic centrifuge tube, 1.5 mL.

4.5

Balance with a sensitivity of 0.1 mg.

4.6

Atomic absorption spectrometer with graphite furnace atomizer, Zeeman calibration device, chrome hollow cathode lamp.

5 Reagent

5.1

Experimental water, deionized water or quartz glass sub-boiling distilled water.

5.2

Nitric acid, high purity.

5.3

Magnesium nitrate hexahydrate, excellent grade.

5.4

Preservation solution. Weigh 0.865 g of magnesium nitrate hexahydrate dissolved in an appropriate amount of water, add 50.0 mL of nitric acid, and dilute to 100 mL.

5.5

Matrix modifier. Weigh 0.865 g of magnesium nitrate hexahydrate dissolved in an appropriate amount of water, add 50.0 mL of nitric acid, and dilute to 1000 mL.

5.6

Chromium standard stock solution. Accurately weigh the reference material potassium dichromate (110 °C, baking 2 h) 1.4315 g (accurate to 0.0001 g), After dissolving with a small amount of water, transfer the whole amount to a 500 mL volumetric flask, add 5.0 mL of nitric acid, dilute to volume with water, and mix. This solution per ml Contains 1.0 mg of chromium. Or purchase a standard stock of chromium monoliths certified by the state and awarded a certificate of reference material.

5.7

Chromium standard intermediate solution [$\rho(\text{Cr}) = 5.0 \mu\text{g/mL}$]. Dilute the standard stock solution of chromium monolith to a concentration of 5.0 $\mu\text{g/mL}$ with a preservation solution.

Standard intermediate solution.

5.8

Chromium standard series solution. respectively absorb chromium standard intermediate solution (5.0 $\mu\text{g/mL}$) 0.0 μL , 30.0 μL , 50.0 μL , 100.0 μL , 200.0 μL , 400.0 μL , and 800.0 μL in a 10 mL volumetric flask, dilute to the mark with a preservation solution, and mix. Per liter in each volumetric flask Containing 0.0 μg , 15.0 μg , 25.0 μg , 50.0 μg , 100.0 μg , 200.0 μg , and 400.0 μg of chromium, respectively. Available now.

6 Sample collection, transportation and storage

Collect chrome-contact workers for more than 50 mL of urine samples at the end of the working week. After measuring creatinine as soon as possible, take 9.0 mL of urine sample

at 10 mL with stopper plastic.

Add 1.0 mL of preservation solution to the tube, mix and refrigerate. The sample can be stored for two weeks at 4 °C and for two months at -20 °C.

7.1 Instrument Operation Reference Conditions

The atomic absorption spectrometer with Zeeman correction device was commissioned to the optimum condition with reference to the following instrument conditions.

- a) wavelength. 357.9 nm;
- b) slit. 0.7 nm;
- c) Injection volume. 10.0 µL;
- d) Graphite furnace conditions.
 - Drying. room temperature ~ 110 ° C, 20 s; 110 ~ 130 ° C, 30 s;
 - ashing. 1300 ° C, 20 s;
 - Atomization. 2300 ° C, 5 s (gas cut);
 - Clear. 2500 ° C, 5 s.

7.2 Preparation and determination of the standard curve

Take 7 1.5 mL plastic centrifuge tubes with caps and draw 0.1 mL of 0.0 µg/L to 400.0 µg/L standard series solution and 0.9 mL of pure water.

In the heart tube, mix and measure, refer to the instrument operation reference conditions for injection measurement. See Table 1 for specific operations. According to the absorbance value of each tube and the chromium concentration (µg/L) Calculate the regression equation.

Table 1 urinary chromium standard curve standard series solution preparation

Test tube number	0	1	2	3	4	5	6	Chromium standard series solution/mL	0.1	0.1	0.1	0.1	0.1	0.1
0.1 0.1 Deionized water/mL	0.9	0.9	0.9	0.9	0.9	0.9	0.9	Chromium concentration/(µg/L)	0.0	1.5	2.5	5.0	10.0	20.0 40.0

7.3 Sample processing and determination

Place the urine sample at room temperature and mix. Determine the sample blank and sample solution by measuring the operating conditions of the standard series of solutions, and subtract the absorbance value After the absorbance value of the standard series 0 tube, the concentration of chromium (µg/L) in the sample was calculated from the regression equation. When the absorbance of the sample exceeds the linear range, Re-take