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

GBZ/T 314-2018

Replacing WS/T 45-1996

**Determination of nickel in blood -- Graphite furnace atomic
absorption spectrometry method**

血中镍的测定 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 45-1996 "Method for the determination of nickel in blood by graphite furnace atomic absorption spectrometry".

The main technical changes compared to WS/T 45-1996 are as follows.

-- Improved sample handling method with 0.1% Triton X-100 solution as diluent.

This standard was drafted. Shenzhen Occupational Disease Prevention and Treatment Institute, Shenzhen Baoan District Center for Disease Control and Prevention, Yantian District, Shenzhen, disease prevention Control Center, Shenzhen Luohu District Center for Disease Control and Prevention.

1 Scope

This standard specifies graphite furnace atomic absorption spectrometry for the determination of nickel in blood.

This standard applies to the determination of nickel in the blood of occupational contacts.

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.

GB/T 6682 Analytical laboratory water specifications and test methods General rules for biological monitoring of GBZ/T 295 occupational population

3 Principle

Blood samples were diluted with 0.1% Triton X-100 solution and measured by graphite furnace atomic absorption spectrometry at 232.0 nm.

4 Instruments

4.1

Atomic absorption spectrophotometer with graphite furnace, Zeeman or other background correction device and nickel hollow cathode lamp.

4.2

Volumetric flask, 50 mL, 100 mL.

4.3

Analyze the balance with a sensation of 0.1 mg.

4.4

Pipettes, 50 L, 100 L, 200 L, 1000 L.

4.5

covered plastic centrifuge tube, 2 mL.

4.6

vortex oscillator.

5 Reagent

5.1

Experimental water. Performed in accordance with GB/T 6682 standard.

5.2

Nitric acid. $\rho_{20}=1.42$ g/mL, excellent grade pure.

5.3

Heparin sodium blood collection tube. excellent grade pure.

5.4

Nitric acid solution. 5 mL of nitric acid was added to 95 mL of water.

5.5

Heparin sodium solution. Weigh 0.5 g of sodium heparin, dissolve in water, add water to 100 mL.

5.6

Triton X-100. Analytical grade.

5.7

Diluent. Take 0.1 mL of Triton X-100, dissolve in an appropriate amount of water, and dilute to 100 mL.

5.8

Nickel Standard Solution. Prepared with a nationally recognized nickel standard solution.

6 Sample collection, transportation and storage

2 mL of blood samples exposed to nickel workers were collected with heparin sodium anticoagulated blood vessels and transported at room temperature or refrigerated.

The samples were stored at 4 ° C and stored for up to 7 days. If it is not refrigerated, store it at room temperature for up to 3 days.

7.1 Instrument Operation Reference Conditions

Refer to Table 1 for instrument operation reference conditions.

Table 1 Instrument operation reference conditions

Instrument condition	Graphite furnace condition	Step temperature	Heating time	Residence time	Wavelength
1. Drying	room temperature	~ 110	5	30	Slit 0.2 nm -- 110 to 130
2. Ashing	130~450	10	10	Injection volume 20 L -- 450~1500	10
3. Atomization	2300	0	5 (discontinued)	4. Cleaning	2500
Carrier gas (Argon)	250 mL/min	3.	Background correction	Zeeman or other	---

7.2 Preparation and determination of the working curve

The nickel standard solution was diluted with a dilution solution into 0.5 g/mL nickel standard application solution, and 7 plastic centrifuge tubes with lids were prepared and prepared according to Table 2.

A standard series of solutions with a concentration of 0 g/L to 160 g/L, in which each tube is mixed with 100 L normal human mixed blood, supplemented with diluent to the whole Accumulate 1.00 mL, mix and measure with reference to the operating conditions of the instrument. See Table 1 for specific operations. Subtract the standard series 2 to 7 tube absorbance values to the standard series After 1 tube absorbance value, the regression equation was calculated with nickel concentration (g/L). The preparation of the working curve is shown in Table 2.

Table 2 Preparation of working curve

Pipe number	1	2	3	4	5	6	7	0.5 g/mL nickel standard	Application fluid, mL	0	0.01	0.02	0.04
	0.08	0.16	0.32	Normal human blood, mL	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	Diluent, mL
	0.90	0.89	0.88	0.86	0.82	0.74	0.58	Nickel content, g/L	blood background value	Blood background	Blood background	Blood background	Blood background

7.3.1 Sample Processing

The blood sample was taken out of the refrigerator and returned to room temperature. After thoroughly shaking the blood sample, dilute it 10 times with the diluent and mix for measurement.

7.3.2 Sample blank

Take heparin sodium blood collection tube, add 1 mL water, dissolve heparin sodium, mix well, take 100 L of this heparin sodium solution, dilute 10 times with dilution solution, Mix well for measurement.

7.3.3 Sample determination

Determine the treated sample and sample blanks by measuring the operating conditions of the calibration series solution, and obtain blood samples and samples from the working curve or regression equation.

The corresponding concentration values of nickel in the blanks are subtracted from each other to obtain the concentration of nickel in the blood sample after treatment. Or subtract the sample blank from the absorbance of the sample.

After the absorbance, divided by the slope of the regression equation, the concentration of nickel in the blood sample after treatment is obtained. Before and after the measurement and after every 10 to 30 samples are measured, the quality control sample was measured once.