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

GBZ/T 304-2018

**Determination of aluminum in urine -- Graphic furnace atomic
absorption spectrometry method**

尿中铝的测定 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 is mainly drafted by. Guangdong Provincial Occupational Disease Prevention and Treatment Institute, Guangzhou Occupational Disease Prevention and Treatment Institute, Shenzhen Occupational Disease Prevention and Treatment Institute, Qingyuan City Center for Disease Control and Prevention, Guangdong Pharmaceutical University.

1 Scope

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

This standard applies to the determination of aluminum in the urine of 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

Urine sample (hereinafter referred to as urine sample) plus diluent treatment, direct injection, at 339.3nm wavelength, using graphite furnace atomic absorption spectrometry the method measures the concentration of aluminum.

4 Instruments

4.1

Graphite furnace atomic absorption spectrometer with background correction device and aluminum hollow cathode lamp.

4.2

Thermostatic platform pyrolytic graphite tube or pyrolytic coated graphite tube.

4.3

stoppered polyethylene plastic bottle, 100mL.

4.4

stoppered polyethylene plastic tube, 5mL, 2mL.

4.5

urine hydrometer.

4.6

Micropipettes, 1000L,.200L, 50L.

4.7

Glass instruments and plastic utensils are soaked in 50% nitric acid for more than 24 hours, rinsed, and dried for use.

5 Reagent

5.1

Experimental water. Distilled water in deionized water or full glass distiller.

5.2

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

5.3

Nitric acid solution, 1% (V/V).

5.4

Polyethylene glycol octyl phenyl ether (TritonX-100), excellent grade.

5.5

Thinner. Add 0.10 mL TritonX-100 and 0.50 mL HNO₃ to 100 mL of deionized water and mix.

5.6

Aluminum standard solution. Nationally recognized standard solution.

5.7

Aluminum Standard Stock Solution and Aluminum Standard Application Solution.
Accurately absorb 10.0 mL of aluminum standard solution (100.0g/mL) and place it in a 100 mL volumetric flask.

Make up to the mark with nitric acid solution, this is the standard stock solution of aluminum, the concentration is 10.0g/mL, dilute the aluminum standard stock solution with diluent when it is used.

0.50 g/mL aluminum standard application solution.

6 Sample collection, transportation and storage

According to the requirements of GBZ/T 295, the polyethylene plastic bottle is used to collect the urine sample of the aluminum contact worker, and after mixing, the urine specific gravity is measured as soon as possible.

After adding 1 mL of nitric acid to a 100 mL urine sample, it should be transported as soon as possible at room temperature, and stored for at least 7 days at 2 °C to 6 °C.

7.1 Instrument operating conditions

The atomic absorption spectrometer was adjusted to the optimum measurement state with reference to the instrument conditions of Table 1.

Table 1 Instrument operation reference conditions

Instrument condition Graphite furnace condition step temperature Heating time Residence time Argon mL/min Wavelength 309.3nm Dry 1 110 5 20 250 Slit 0.7nm dry 2 130 15 30 250 Lamp current 25mA Ashing 1 1000 15 10 250 Injection volume 10 μ L Ashing 2 1400 10 20 250 Integral mode peak area atomization 2300 0 3 0 Graphite tube constant temperature platform cleaning 2450 1 5 250

7.2 Sample Processing

Shake the urine sample, pipette the urine sample 0.20mL into the polyethylene plastic tube, add 0.80mL of diluent, mix thoroughly, to be tested;

When the urine sample was replaced with 0.20 mL of deionized water, the sample was treated as the reagent blank. If the urinary aluminum content exceeds the measurement range of this law, Increase the dilution factor and measure.

7.3 Drawing of the working curve

Take 7 plastic tubes with polyethylene plugs, prepare the working curve of urine aluminum according to Table 2 or prepare for automatic dilution of the instrument. Refer to the operating conditions of the instrument, the original the sub-absorption spectrophotometer was adjusted to the optimum measurement state, and 10 L was injected, and the absorbance values of the respective tubes were measured, and the absorbance of each tube was subtracted from the absorbance of the first tube.

The luminosity value is the ordinate and the aluminum concentration is the abscissa, and the working curve is drawn.

Table 2 Preparation of urine aluminum working curve

Pipe number	1	2	3	4	5	6	7	Aluminum standard application solution/mL	0.0	0.010	0.020	0.040	0.060	0.080	0.100	Thinner/mL	0.80	0.79	0.78	0.76	0.74	0.72	0.70	Background urine/mL	0.20	0.20	0.20	0.20	0.20	0.20	0.20	Urine aluminum spiked concentration/(μ g/L)	0.0	5.0	10.0	20.0	30.0	40.0	50.0
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7.4 Sample determination

The sample and reagent blank solution are determined by the operating conditions of the assay standard series, and the measured absorbance value of the sample is subtracted from the reagent blank absorbance value.

After that, the concentration of aluminum (g/L) was obtained from the standard curve.

8 Calculation