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

GBZ/T 309-2018

**Determination of acetone in urine -- Headspace-gas
chromatography method**

尿中丙酮的测定 顶空-气相色谱法

(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. Wuhan University of Science and Technology, Hubei University of Traditional Chinese Medicine, Wuhan Occupational Disease Prevention and Treatment Institute.

1 Scope

This standard specifies headspace-gas chromatography for the determination of acetone in urine.

This standard applies to the determination of acetone in 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 GB/T 6682

Analytical laboratory water specifications and experimental methods

3 Principle

After the acetone in the urine sample (hereinafter referred to as the urine sample) is pretreated by the headspace technique, a certain amount of the headspace gas is injected into the gas chromatograph.

Separation by capillary column, detection by hydrogen flame ionization detector, retention time qualitative, peak height or peak area quantification.

4 Instruments

4.1

Glass headspace bottle. 20 mL with silicone gasket.

4.2

Constant temperature water bath. Temperature control accuracy ± 1 °C.

4.3

Vortex mixer.

4.4

Electronic balance.

4.5

Microinjector. 100 μ L.

4.6

Hermetic syringe. 1 mL.

4.7

Polyethylene plastic bottle. 50 mL.

4.8

urine hydrometer.

4.9

Gas Chromatograph, Hydrogen Flame Ionization Detector, Instrument Operation Reference Conditions.

a) Column. 30 m x 0.32 mm x 0.25 μ m, dimethylpolysiloxane (100%) capillary column, or nitro-p-xylylene an acid-modified polyethylene glycol capillary column; or a capillary column of the same polarity.

b) Column temperature. 60 °C;

- c) inlet temperature. 150 °C;
- d) detector temperature..200 °C;
- e) carrier gas (nitrogen) flow. 1.2 mL/min;
- f) hydrogen flow. 30 mL/min;
- g) Split ratio. 10.1.

5 Reagent

5.1

Experimental water. According to GB/T 6682.

5.2

Acetone, chromatographically pure.

5.3

hydrochloric acid, analytically pure.

5.4

anhydrous sodium sulfate, analytically pure.

5.5

Acetone standard solution. Pre-add 50.0 mL of water in a 100 mL volumetric flask, and accurately measure 100.0 µL of acetone with a micro-syringe.

Into the volumetric flask, add water to the mark and mix well. This solution is a 788.0 mg/L acetone standard solution or use the purchased standard material.

6 Sample collection, transportation and storage

Collecting acetone contact with polyethylene plastic bottle, the end of the urine within 1 h before leaving work, tightly sealed, returned to the laboratory, after measuring the specific gravity, press 100.1 the ratio of 1.1 hydrochloric acid was added as a preservative and determined as soon as possible. The urine sample can be stored in a refrigerator at 4 °C for one week.

7 Analysis steps

7.1

Sample processing. Mix the urine sample collected on the same day before the measurement; the urine sample stored in the refrigerator at 4 °C, take it back to room temperature, shake well and measure.

7.2

Drawing of the standard curve. Dilute the acetone standard solution to 0.0 mg/L, 5.0 mg/L, 10.0 mg/L, 20.0 mg/L with deionized water, Standard series of solutions 40.0 mg/L, 80.0 mg/L, 160.0 mg/L. Take 3.0 mL of the standard series solution into the headspace bottle and add 4.0.

g anhydrous sodium sulfate (4.0 g sodium chloride can be added instead of anhydrous sodium sulfate), then immediately seal the bottle mouth with the matching bottle cap, vortex and mix for 30 s After that, equilibrate in a constant temperature water bath for 50 min, extract 1.0 mL of the upper gas in the bottle with a 1 mL syringe, and quickly inject into the gas chromatograph.

The instrument was measured in accordance with the operating conditions of 4.9, and each concentration was injected three times in parallel. The peak height or peak area average is the ordinate, acetone concentration (mg/L) for the abscissa, draw a standard curve or calculate a regression equation.

7.3

Sample determination. Take 3.0 mL of each sample and blank urine sample, place in a headspace bottle, and measure according to the operating conditions of the standard series.

The high or peak area is determined by a standard curve or a regression equation to determine the concentration of acetone in the urine (mg/L).

8 Calculation

8.1

Calculate the concentration correction factor (k) in the urine sample converted to the standard specific gravity (1.020) according to equation (1).

$$1.020 \ 1.000$$

$$1.000$$

- measured specific gravity (1)

8.2 Calculate the concentration of acetone in urine according to formula (2)

$$C = C_0 \times k \quad (2)$$

In the formula.

C -- the concentration of acetone in the urine, mg/L;

C₀ - the acetone concentration obtained from the standard curve or the regression equation, mg/L;