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General Method of Test for Heavy Metals

1. Scope

1.1. This method is applicable for the determination of heavy metals in foods. Depending on the type of element analyzed, sample matrix, limit of quantification and laboratory equipment, etc., select appropriate pre-treatment digestion process (dry ashing, acid digestion, microwave-assisted acid digestion, sulfuric acid-nitric acid digestion, magnesium oxide digestion, sulfuric acid-nitric acid reflux digestion or microwave assisted sulfuric acid-nitric acid reflux digestion) and appropriate quantitative method (flame atomic absorption spectrometry (FAAS), graphite furnace atomic absorption spectrometry (GFAAS), inductively coupled plasma optical emission spectrometry (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), hydride generation-atomic absorption spectrometry (HGAAS), cold vapor -atomic absorption spectrometry (CV-AAS), cold vapor-mercury atomic fluorescence spectrometry (CV-AFS) and direct mercury analysis) to combine into a complete applicable analysis method which should be validated, and adopt related quality control guidance.

1.2. If there is a discrepancy between the test results from the general method and that from the method announced by the Ministry of Health and Welfare in accordance with the sanitation standards or specific needs, the latter shall have priority.

2. Method

2.1. Equipment

2.1.1. Flame atomic absorption spectrophotometer.

2.1.2. Graphite furnace atomic absorption spectrophotometer.

2.1.3. Inductively coupled plasma optical emission spectrometer.

2.1.4. Inductively coupled plasma mass spectrometer.

2.1.5. Hydride generator.

2.1.6. Mercury cold vapor generator.

2.1.7. Mercury atomic fluorescent spectrophotometer.

2.1.8. Direct mercury analyzer.

2.1.9. Furnace: with an automatic temperature control.

2.1.10. Hot plate.

2.1.11. Water bath.

2.1.12. Microwave digester: with temperature control and pressure feedback system.

2.1.13. Focused microwave digester: with microwave power setting.

2.1.14. Acid steam cleaning system.

2.1.15. Blender: stainless steel, with removable and cleanable knives.

2.2. Chemicals

2.2.1. Nitric acid, low mercury grade, ultrapure grade and reagent grade;

Hydrochloric acid, sulfuric acid and perchloric acid, ultrapure grade;

n-Octanol, ammonium oxalate, magnesium oxide, magnesium nitrate, potassium iodide, sodium hydroxide, sodium borohydride, urea, potassium permanganate, hydrogen peroxide (30%), sodium chloride, hydroxylamine sulfate, stannous chloride and vanadim pentaoxide, reagent grade;

Deionized water, resistivity ≥ 18 MΩ·cm (at 25°C).

2.2.2. Matrix modifier I (containing 1000 μg/mL magnesium nitrate), matrix modifier II (containing 10000 μg/mL ammonium dihydrogen phosphate and 500 μg/mL magnesium nitrate) and matrix modifier III (mixed solution, containing 1000 μg/mL palladium and 600 μg/mL magnesium nitrate), AA grade.

2.2.3. Reference standards

2.2.3.1. FAAS or GFAAS:

Lead, cadmium, copper, antimony, arsenic, mercury, tin and zinc, 1000 μg/mL, reference standards, AA or ICP grade.

2.2.3.2. ICP-OES or ICP-MS:

Lead, cadmium, copper, antimony, arsenic, mercury, tin and zinc, 1000 μg/mL, reference standards, ICP grade.

2.2.3.3. HGAAS:

Arsenic, 1000 μg/mL, reference standard, AA or ICP grade.

2.2.3.4. CV-AAS, CV-AFS or direct mercury analysis:

Mercury, 1000 μg/mL, reference standard, AA or ICP grade.

2.3. Apparatus(note):

2.3.1. Volumetric flask: 25 mL, 50 mL, 100 mL, 200 mL and 1000 mL, Pyrex.

2.3.2. Storage tube: 50 mL, PP.

2.3.3. Crucible: ceramic, quartz or platinum, with cap.

2.3.4. Digestion flask: 50 mL, glass, PP, Teflon, or an equivalent product.

2.3.5. Microwave digestion flask: quartz, Teflon, or an equivalent product.

2.3.6. Sample boat: 1500 μL, metal, ceramic, or quartz.

2.3.7. Membrane filter: 0.45 μm, Teflon.

2.3.8. Kjeldahl flask: 500 mL, Pyrex.

2.3.9. Modified Soxhlet extractor.

Note：After cleaning, use acid steam cleaning system to clean the apparatus with nitric acid (reagent grade) vapor for 2 hr, or soak the apparatus in nitric acid (reagent grade): water (1:1, v/v) overnight. Take the apparatus out, wash away the residual nitric acid with deionized water and dry.

2.4. Reagents

2.4.1. 1 N Nitric acid

Add 70 mL of nitric acid (ultrapure grade) slowly into 500 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.2. 0.1 N Nitric acid

Add 7 mL of nitric acid (ultrapure grade) slowly into 500 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.3. 1% Nitric acid

Add 15 mL of nitric acid (ultrapure grade) slowly into 500 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.4. 6 N Hydrochloric acid

Add 500 mL of hydrochloric acid slowly into 300 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.5. 4 N Hydrochloric acid

Add 334 mL of hydrochloric acid slowly into 300 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.6. 3 N Hydrochloric acid

Add 250 mL of hydrochloric acid slowly into 300 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.7. Ammonium oxalate saturated solution

Dissolve 50 g of ammonium oxalate with 100 mL of deionized water, and add excessive ammonium oxalate until unable to be dissolved.

2.4.8. 40% Potassium iodide

Dissolve 20 g of potassium iodide with 30 mL of deionized water, and dilute to 50 mL with deionized water.

2.4.9. 50% Magnesium nitrate

Dissolve 50 g of magnesium nitrate with 50 mL of deionized water, and dilute to 100 mL with deionized water.

2.4.10. 10% Urea

Dissolve 50 g of urea with 300 mL of deionized water, and dilute to 500 mL with deionized water.

2.4.11. 10% Hydrogen peroxide

Dilute 33 mL of 30% hydrogen peroxide to 100 mL with deionized water.

2.4.12. 1% Sulfuric acid

Add 10 mL of sulfuric acid slowly into 300 mL of deionized water, and dilute to 1000 mL with deionized water.

2.4.13. 1% Sodium borohydride

Dissolve 10 g of sodium hydroxide with 500 mL of deionized water, add 10 g of sodium borohydride, and dissolve it. Dilute to 1000 mL with deionized water. Prepare before use.

2.4.14. Stannous chloride solution

Add 50 mL of sulfuric acid slowly into 300 mL of deionized water, and cool to room temperature. Add 15 g of sodium chloride, 15 g of hydroxylamine sulfate and 25 g of stannous chloride, and dissolve them. Dilute to 500 mL with deionized water. Prepare before use.

2.4.15. Vanadim pentaoxide solution

Transfer about 10 g of vanadim pentaoxide into a crucible, heat at 200°C for 24 hr, and then heat at 350°C for 72 hr. Cool and transfer 1 g into 1000 mL of sulfuric acid. Stir to dissolve it for later use.

2.5. Standard solution preparation

2.5.1. FAAS:

Accurately transfer 1 mL of each reference standard into a 50-mL volumetric flask, make up to volume with 1% nitric acid, and transfer to storage tubes as the standard stock solutions. When to use, dilute appropriate amount of each standard stock solution to 1-10 μg/mL with 1% nitric acid, and transfer to storage tubes as the standard solutions.

2.5.2. GFAAS:

Accurately transfer 1 mL of each reference standard into a 50-mL volumetric flask, make up to volume with 1% nitric acid, and transfer to storage tubes as the standard stock solutions. When to use, dilute appropriate amount of each standard stock solution to 10-50 ng/mL with 1% nitric acid, and transfer to storage tubes as the standard solutions.

2.5.3. ICP-OES:

Accurately transfer 1 mL of each reference standard into a 50-mL volumetric flask, make up to volume with 1% nitric acid, and transfer to storage tubes as the standard stock solutions. When to use, mix appropriate amount of the standard stock solutions, dilute to 10-1000 ng/mL with 1% nitric acid, and transfer to storage tubes as the standard solutions.

2.5.4. ICP-MS:

Accurately transfer 1 mL of each reference standard into a 50-mL volumetric flask, make up to volume with 1% nitric acid, and transfer to storage tubes as the standard stock solutions. When to use, mix appropriate amount of the standard stock solutions, dilute to 1-25 ng/mL with 1% nitric acid, and transfer to storage tubes as the standard solutions.

2.5.5. HGAAS:

Accurately transfer 1 mL of arsenic reference standard into a 50-mL volumetric flask, make up to volume with 4 N hydrochloric acid, and transfer to a storage tube as the standard stock solution. When to use, dilute appropriate amount of the standard stock solution to 1-10 ng/mL with 4 N hydrochloric acid, and transfer to storage tubes as the standard solutions.

2.5.6. CV-AAS:

Accurately transfer 1 mL of mercury reference standard into a 50-mL volumetric flask, make up to volume with 3 N hydrochloric acid, and transfer to a storage tube as the standard stock solution. When to use, dilute appropriate amount of the standard stock solution to 1-10 ng/mL with 3 N hydrochloric acid, and transfer to storage tubes as the standard solutions.

2.5.7. CV-AFS:

Accurately transfer 1 mL of mercury reference standard into a 50-mL volumetric flask, make up to volume with 0.1 N nitric acid, and transfer to a storage tube as the standard stock solution. When to use, dilute appropriate amount of the standard stock solution to 0.25-1.0 ng/mL with 0.1 N nitric acid, and transfer to storage tubes as the standard solutions.

2.5.8. Direct mercury analysis:

Accurately transfer 100 μL of mercury reference standard into a 50-mL volumetric flask, make up to volume with 1% nitric acid, and transfer to a storage tube as the standard stock solution. When to use, dilute appropriate amount of the standard stock solution to 10-1000 ng/mL with 1% nitric acid, and transfer to storage tubes as the standard solutions.

2.6. Sample solution preparation

2.6.1. Dry ashing: applicable for lead, cadmium, copper and zinc.

Transfer about 1-5 g of the homogenized sample accurately weighed into a crucible, heat on a hot plate until carbonized and smokeless. Place in a furnace, and ash at 450°C for 3-5 hr. If ashing is incomplete, add 0.5-3 mL of nitric acid after cooling, and heat on a hot plate. After drying, place in a furnace, ash at 450°C for 3-5 hr, and repeat the above procedure until the ash becomes white. Dissolve the residue with 5 mL of 6 N hydrochloric acid after cooling, and evaporate to dryness on a hot plate. Add 5 mL of 1 N nitric acid, and heat to dissolve the residue. After cooling to room temperature, transfer to a 25-mL volumetric flask, wash and rinse the residue in the crucible and the cap with 5 mL of 1 N nitric acid twice. Add the washings to

the same volumetric flask, and make up to volume with deionized water. Transfer to a storage tube, filter with a membrane filter, and take the filtrate as the sample solution. Take an empty crucible, and perform the same procedure described above as the blank solution.

2.6.2. Acid digestion: applicable for lead, cadmium, copper, antimony, arsenic, tin and zinc.

Transfer about 1 g of the homogenized sample accurately weighed into a digestion flask, and add 10 mL of nitric acid (ultrapure grade). Digest on a hot plate at 60°C for 30 min, then raise the temperature to 95°C, and digest to clear. After cooling to room temperature, transfer to a 25-mL volumetric flask, wash and rinse the residue in the digestion flask with 5 mL of deionized water several times. Add the washings to the same volumetric flask, and make up to volume with deionized water. Transfer to a storage tube, filter with a membrane filter, and take the filtrate as the sample solution. Take an empty digestion flask, and perform the same procedure described above as the blank solution.

2.6.3. Microwave assisted acid digestion: applicable for lead, cadmium, copper, antimony, arsenic, mercury, tin and zinc.

Transfer about 0.2-0.5 g of the homogenized sample accurately weighed into a microwave digestion flask, add 10 mL of nitric acid (ultrapure grade), and then digest until clear according to the following conditions. After cooling to room temperature, transfer to a 25-mL volumetric flask, wash and rinse the residue in the digestion flask with 5 mL of deionized water several times. Add the washings to the same volumetric flask, and make up to volume with deionized water. Transfer to a storage tube, filter with a membrane filter, and take the filtrate as the sample solution. Take an empty microwave digestion flask, and perform the same procedure described above as the blank solution.

Microwave digester operating condition(Note):

Condition / Step	Power (W)	Heating time (min)	Duration time (min)	Temperature (°C)	Pressure (bar)
1	600	10	10	180	40
2	1000	10	20	180	40

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.6.4. Sulfuric acid-nitric acid digestion: applicable for arsenic.

Transfer about 5-20 g of the homogenized sample accurately weighed into a digestion flask, add 10-40 mL of nitric acid (ultrapure grade), mix gently, and stand overnight. Heat on a hot plate slowly until the violent reaction stops. After cooling, add 5-20 mL of sulfuric acid, and heat on a hot plate slowly. Add few drops of *n*-octanol as a defoamer if violent foaming occurs. When the digestion liquid turns into dark, add 2-3 mL of nitric acid (ultrapure grade) each time until white smoke appears and the digestion liquid turns into light yellow or colorless. If the digestion liquid does not turn into light yellow or colorless, add 1 mL of perchloric acid and 2-3 mL of nitric acid (ultrapure grade), and continue heating to complete digestion. Cool to room temperature, add 30-50 mL of deionized water and 10-25 mL of ammonium oxalate saturated solution, and heat until white smoke appears. Cool to room temperature, and transfer to a 200-mL volumetric flask, wash and rinse the residue in the digestion flask with 5 mL of 6 N hydrochloric acid several times. Add washings to the same volumetric flask, and make up to volume with 6 N hydrochloric acid as the sample solution. Take an empty digestion flask, and perform the same procedure described above as the blank solution.

2.6.5. Magnesium oxide digestion: applicable for arsenic.

Transfer about 5 g of the homogenized sample accurately weighed into a crucible, add a little bit of magnesium oxide to make alkaline, and then add 5 mL of 50% magnesium nitrate to evenly moistened. Place in a furnace after heating to dryness, and ash at 500°C. If ashing is incomplete, repeat adding 50% magnesium nitrate dropwise, and heat to complete ashing. After cooling, add 1 mL of sulfuric acid, and heat until white smoke appears. Dissolve the residue with 10 mL of 6 N hydrochloric acid after cooling, and transfer to a 25-mL volumetric flask. Wash and

rinse the residue in the crucible and the cap with 5 mL of 6 N hydrochloric acid twice. Add the washings to the same volumetric flask, and make up to volume with deionized water as the sample solution. Take an empty crucible, and perform the same procedure described above as the blank solution.

2.6.6. Sulfuric acid-nitric acid reflux digestion: applicable for mercury.

Transfer about 5 g of the homogenized sample accurately weighed into a digestion flask of the modified Soxhlet extractor, add 10 mL of deionized water and 20 mL of nitric acid (low mercury grade), and mix well. After standing a period of time, add 20 mL of sulfuric acid slowly, and put the digestion flask into the modified Soxhlet extractor. Heat slowly in a water bath until the digestion liquid turns into clear light yellow. If the digestion liquid does not turn into clear light yellow, add 5 mL of nitric acid (low mercury grade) after cooling, and repeat the above procedure until the digestion liquid turns into clear light yellow. Cool to room temperature, add 50 mL of deionized water and 10 mL of 10% urea, and heat to boiling for 10 min. Add 1 g of potassium permanganate after cooling, and shake for 10 min. If the purple-red color of the digestion liquid disappears, repeat adding 1 g of potassium permanganate and shaking for 10 min until the purple-red color does not disappear. Cool to room temperature, add 10% hydrogen peroxide dropwise until the purple-red color disappears, and transfer to a 200-mL volumetric flask. Wash and rinse the residue in the digestion flask and the glass junction with 1% sulfuric acid. Add washings to the same volumetric flask, and make up to volume with deionized water as the sample solution. Take an empty digestion flask, add 10 mL of deionized water and 20 mL of nitric acid (low mercury grade), and perform the same procedure described above as the blank solution.

2.6.7. Microwave assisted sulfuric acid-nitric acid reflux digestion: applicable for mercury.

Transfer about 1 g of the homogenized sample accurately weighed into a microwave digestion flask, add 10 mL of vanadim pentaoxide solution slowly, mix well, and stand for 2 hr. Add 10

mL of nitric acid (low mercury grade) slowly, connect to a condenser, and stand for 4 hr. Transfer the digestion flask to a focused microwave digester, and heat by 30 W microwave for 10 min, then 80 W for 35 min, and repeat heating until the digestion liquid turns into clear light yellow. Stand to cool for 1-2 hr, add 20 mL of 10% urea slowly, and mix well. After complete reaction, transfer to a 50-mL volumetric flask, wash and rinse the residue in the condenser and the digestion flask with deionized water. Add washings to the same volumetric flask, and make up to volume with deionized water as the sample solution. Take an empty microwave digestion flask, add 10 mL of vanadim pentaoxide solution, and perform the same procedure described above as the blank solution.

2.7. Quantification

2.7.1. Detection

2.7.1.1. FAAS: applicable for lead, cadmium, copper, antimony, tin and zinc.

Inject the sample solution, the blank solution and the standard solutions into the flame atomic absorption spectrometer separately at appropriate rate, and operate according to the following conditions. Calculate the amount of each heavy metal in the sample by the formula described in section 2.7.2.

FAAS operating conditions(Note):

Element	Wavelength (nm)	Fuel	Oxidant
Lead	283.3	Acetylene	Air
Cadmium	228.8	Acetylene	Air
Copper	324.7	Acetylene	Air
Antimony	217.6	Acetylene	Air
Tin	286.3	Acetylene	N_2O
Zinc	213.9	Acetylene	Air

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.2. GFAAS: applicable for lead, cadmium, copper, antimony, arsenic, tin and zinc.

Accurately take 20 μL of the sample solution, the blank solution and the standard solutions, add 2 μL of the matrix modifier (matrix modifier III for copper, antimony, arsenic and tin; matrix modifier II for lead and cadmium; matrix modifier I for zinc), and inject into the graphite furnace atomic absorption spectrophotometer separately. Operate according to the following conditions to analyze each element at the specific wavelength (283.3 nm, 228.8 nm 324.7 nm, 217.6 nm, 193.7 nm, 286.3 nm and 213.9 nm for lead, cadmium, copper, antimony, arsenic, tin and zinc, respectively). Calculate the amount of each heavy metal in the sample by the formula described in section 2.7.2.

GFAAS operating conditions(Note):

Condition / Step	Temp (°C)	Ramp time (sec)	Hold time (sec)	Gas flow (mL/min)	Gas
Drying	110	5	30	250	Argon
	130	15	30	250	Argon
Ashing	450	10	20	250	Argon
	650	10	20	250	Argon
Atomization	1600	—	5	—	—
Cleaning	2450	1	3	250	Argon

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.3. ICP-OES: applicable for lead, cadmium, copper, antimony, arsenic, mercury, tin and zinc.

Inject the sample solution, the blank solution and the standard solutions into the inductively coupled plasma optical emission spectrometer separately at appropriate rate, and operate according to the following conditions. Calculate the amount of each heavy metal in the sample by the formula described in section 2.7.2.

ICP-OES operating conditions(Note):

Parameter	Condition
Radiofrequency power (W)	1300
Plasma argon flow rate (L/min)	15

Auxiliary argon flow rate (L/min)		0.2
Nebulizer argon flow rate (L/min)		0.8
Wavelength (nm)	Lead	220.353
	Cadmium	228.802
	Copper	327.393
	Antimony	206.836
	Arsenic	193.696
	Mercury	253.652
	Tin	189.927
	Zinc	206.200

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.4. ICP-MS: applicable for lead, cadmium, copper, antimony, arsenic, mercury, tin and zinc.

Inject the sample solution, the blank solution and the standard solutions into the Inductively coupled plasma mass spectrometer separately at appropriate rate, and operate according to the following conditions. Calculate the amount of each heavy metal in the sample by the formula described in section 2.7.2.

ICP-MS operating conditions(Note):

Parameter		Condition
Radiofrequency power (W)		1300
Plasma argon flow rate (L/min)		15
Auxiliary argon flow rate (L/min)		0.2
Nebulizer argon flow rate (L/min)		0.8
Mass (*m/z*)	Lead	208, 207, 206
	Cadmium	114, 111
	Copper	63, 65
	Zinc	64, 66
	Antimony	123
	Arsenic	75
	Mercury	200

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.5. HGAAS: applicable for arsenic.

Accurately take 10 mL of the sample solution, the blank

solution and the standard solutions separately, add 1 mL of 40% potassium iodide, and stand in the dark for 30 min. Inject into the hydride generator separately, and operate according to the following conditions. Calculate the amount of arsenic in the sample by the formula described in section 2.7.2.

HGAAS operating conditions(Note):

Condition / Step	Time (sec)	Flow rate (mL/min)		
		1% Sodium borohydride	Sample solution	4 N Hydrochloric acid
Delay	10	4.5	—	9.0
Generation	15	4.5	9.0	—
Analysis	50	4.5	9.0	—
Cleaning	60	4.5	—	9.0

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.6. CV-AAS: applicable for mercury.

Inject the sample solution, the blank solution, and the standard solutions into the mercury cold vapor generator separately, and operate according to the following conditions. Calculate the amount of mercury in the sample by the formula described in section 2.7.2.

CV-AAS operating conditions(Note):

Condition / Step	Time (sec)	Flow rate (mL/min)		
		Stannous chloride solution	Sample solution	Deionized water
Delay	10	4.5	—	9.0
Generation	15	4.5	9.0	—
Analysis	50	4.5	9.0	—
Cleaning	60	4.5	—	9.0

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.7. CV-AFS: applicable for mercury.

Inject the sample solution, the blank solution, and the

standard solutions into the mercury atomic fluorescent spectrophotometer separately, and operate according to the following conditions. Calculate the amount of mercury in the sample by the formula described in section 2.7.2.

CV-AFS operating conditions(Note):

Condition / Step	Time (sec)	Flow rate (mL/min)		
		Stannous chloride solution	Sample solution	Deionized water
Delay	10	4.5	—	9.0
Generation	15	4.5	9.0	—
Analysis	50	4.5	9.0	—
Cleaning	60	4.5	—	9.0

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.8. Direct mercury analysis: applicable for mercury.

2.7.1.8.1. Standard curve preparation

Accurately transfer 100 μL of the standard solutions into each sample boat of the direct mercury analyzer, and operate according to the following conditions. Establish the standard curve of mercury base on the absorbance of mercury vs. the weight of mercury (ng).

Direct mercury analyzer operating conditions(Note):

Step / Condition		Temp (°C)	Ramp time (sec)	Hold time (sec)	Gas flow rate (mL/min)	Gas
Decomposition furnace	Drying	200	120	120	160	oxygen
	Decomposition	650	120	180	160	oxygen
Absorption cells	Adsorption	—	—	60	160	oxygen
	desorption	850	—	12	160	oxygen

Note: All the parameters can be adjusted depending on the instruments used if the above conditions are not applicable.

2.7.1.8.2. Quantification

Take about 200 mg of the homogenized sample accurately weighed into a sample boat of the direct mercury analyzer,

and operate according to the conditions described in section 2.7.1.8.1. Calculate the amount of mercury in the sample by the following formula:

$$\text{The amount of mercury in the sample (ppm)} = \frac{C}{M}$$

Where,

C: the amount of mercury in the sample calculated by the standard curve (ng)

M: the weight of the sample (mg)

2.7.2. Calculation

After detection according to section 2.7.1, calculate the amount of each heavy metal in the sample by the following formula:

$$\text{The amount of each heavy metal in the sample (ppm)} = \frac{(C - C_0) \times V}{M}$$

Where,

C: the concentration of each heavy metal in the sample solution calculated by the standard curve (μg/mL)

C_0: the concentration of each heavy metal in the blank solution calculated by the standard curve (μg/mL)

V: the final make-up volume of the sample (mL)

M: the weight of the sample (g)

Remark

1. When the general method is used to analyze other elements, method validation should be performed and adopt related quality control guidance.
2. The validated method refering to the general method should address the scope, applied elements and limits of quantification (LOQs). The LOQs of the validated method should meet those of the official method announced by the Ministry of Health and Welfare.
3. Further validation should be performed when interference compounds appear in samples.