

Revision of migration specifications of cadmium and lead for glass, ceramic, and enameled equipments and containers for food use

1. Outline

The Ministry of Health, Labour and Welfare (MHLW) of Japan intends to revise the current migration specifications for lead and cadmium in glass, ceramic, or enameled equipment and containers for food use. The current specifications were established in 1986, taking account of the following ISO, International Organization for Standardization, standards; ISO6486 for ceramic ware, glass-ceramic ware and glass dinnerware established in 1981 and ISO7086 for glass hollowware established in 1982.

Then in 1998, ISO4531 for vitreous and porcelain enameled ware was newly established, followed by the revision of ISO6486 in 1999 and ISO7086 in 2000. The draft revised migration specifications for lead and cadmium from glass, ceramic or enameled equipments and containers were proposed in the report of the health, labour and welfare science research conducted in the fiscal years 2004 and 2005, based on the ISO specifications.

2. Details

Currently, the maximum migration levels of cadmium and lead are specified as common specifications to glass, ceramic, and enameled equipments and containers in the section “D Specifications by materials of the equipments and containers or their source materials” in the section 3 “Equipments and containers/packages” of the Ministry of Health, Labour and Welfare Announcement No.370 (1959). By the planed revision, the migration specifications will be set on the material by material basis, considering ISO specifications (ISO4531, ISO6486 and ISO7086). In addition, specifications are going to be set capacity by capacity of the equipments and containers for each material category (e.g., three categories for glass equipments and containers: 1) less than 600 ml, 2) 600 ml and over and less than 3 L, and 3) 3 L and over), and the specifications for heat-cooking equipments will be newly introduced for each material category.

The current and draft new specifications are given in the next page. The draft revised testing methods and specifications are given in the Appendix.

3. Future work

Revised specification will be promulgated end of April 2008, and will take effect six month after promulgation.

Current and proposed new specifications

<Current migration limits>

Glass, ceramic, and enameled equipments and containers

	Capacity	Cadmium (Cd)	Lead (Pb)
2.5 cm or deeper ^(*1)	Less than 1.1 L	0.5 µg/ml	5 µg/ml
	1.1 L and more	0.25 µg/ml	2.5 µg/ml
Cannot be filled, or less than 2.5 cm depth ^(*2)		1.7 µg/cm ² ^(*3)	17 µg/cm ² ^(*3)

<Proposed revision of the migration limits>

Glass equipments and containers

	Capacity	Cadmium (Cd)	Lead (Pb)
2.5 cm or deeper ^(*1)	Less than 600 ml	0.5 µg/ml	1.5 µg/ml
	600 ml and more, and less than 3 L	0.25 µg/ml	0.75 µg/ml
	3 L and more	0.25 µg/ml	0.5 µg/ml
	Heat-cooking ware	0.05 µg/ml	0.5 µg/ml
Cannot be filled, or less than 2.5 cm depth ^(*2)		0.7 µg/cm ² ^(*3)	8 µg/cm ² ^(*3)

Ceramic equipments and containers

	Capacity	Cadmium (Cd)	Lead (Pb)
2.5 cm or deeper ^(*1)	Less than 1.1 L	0.5 µg/ml	2 µg/ml
	1.1 L and more, and less than 3 L	0.25 µg/ml	1 µg/ml
	3 L and more	0.25 µg/ml	0.5 µg/ml
	Heat-cooking ware	0.05 µg/ml	0.5 µg/ml
Cannot be filled, or less than 2.5 cm depth ^(*2)		0.7 µg/cm ² ^(*3)	8 µg/cm ² ^(*3)

Enameled equipments and containers

	Capacity	Cadmium (Cd)	Lead (Pb)
2.5 cm or deeper, ^(*1) except products with the capacity of 3 L or over	Other than heat cooking ware and less than 3 L	0.07 µg/ml	0.8 µg/ml
	Heat-cooking ware and less than 3L	0.07 µg/ml	0.4 µg/ml
Cannot be filled, or less than 2.5 cm depth ^(*2)	Other than heat cooking ware	0.7 µg/cm ² ^(*3)	8 µg/cm ² ^(*3)
	Heat-cooking ware	0.5 µg/cm ² ^(*3)	1 µg/cm ² ^(*3)
Products with the capacity of 3 L or over		0.5 µg/cm ² ^(*3)	1 µg/cm ² ^(*3)

Note:

(*1): Product whose depth is 2.5 cm or deeper when filled with liquid

(*2): Product that cannot be filled with liquid or products whose depth is less than 2.5 cm when filled with liquid

(*3): the amount migrated per unit surface area of the sample equipments or containers

The amount migrated into test solution shall be equal to or less than the limit shown in the table above.

Appendix

<Draft proposed revision of the testing methods and specifications>

“Standards and specifications for food, food additives etc.”, the Announcement No.370 of the Ministry of Health and Welfare (1959)

Section 3. Equipment and Containers/Packages

C. Regents and Test Solutions

4. Standard Solutions, Standard Stock Solution

Cadmium Standard Stock Solution (method of preparation omitted due to no change)

Cadmium Standard Solution (method of preparation omitted due to no change)

~~Cadmium standard solution (for testing of glass products)~~ ← delete

Lead Standard Stock Solution (method of preparation omitted due to no change)

Lead Standard Solution (method of preparation omitted due to no change)

D. Specifications by Material Category for Equipment, Containers/Packages, or their Raw Materials

1. Glass, ceramic, or enameled equipments and containers

Glass, ceramic, or enameled equipments and containers shall meet the requirements when tested by the following methods.

A. Products that can contain liquid 2.5 cm or deeper, except enameled products with the internal capacity of 3 L and over.

(1) Preparation of test solutions

Wash the sample well with water, and then fill it with 4% acetic acid aqueous solution, and allow to stand at room temperature in a dark place for 24 hours. Transfer the acetic acid into a beaker, and use it as the test solution.

(2) Migration test

a. Cadmium and lead

i. Generation of the calibration curve

Dilute Cadmium Standard Solution and Lead Standard Solution with 4% acetic acid into appropriate concentrations. Determine the concentrations of cadmium and lead in these solutions by atomic absorption spectrophotometry or inductively coupled plasma atomic emission spectrometry, and prepare a calibration curve respectively.

ii. Quantification

Determine the concentrations of cadmium and lead leached in the test solution by

atomic absorption spectrophotometry or inductively coupled plasma atomic emission spectrometry, and obtain the amount of migration ($\mu\text{g/ml}$) of each element. The amount leached per unit area shall be equal to or less than the limits given in Columns 2 for cadmium and Column 3 for lead, for corresponding category given in Column 1 of the following table.

Column 1		Column 2 (Cd)	Column 3 (Pb)
Glass equipment and containers			
Products other than heat-cooking ware			
	Less than 600 ml	0.5 $\mu\text{g/ml}$	1.5 $\mu\text{g/ml}$
	600 ml and over and less than 3 L	0.25 $\mu\text{g/ml}$	0.75 $\mu\text{g/ml}$
	3 L and over	0.25 $\mu\text{g/ml}$	0.5 $\mu\text{g/ml}$
	Heat-cooking ware	0.05 $\mu\text{g/ml}$	0.5 $\mu\text{g/ml}$
Ceramic equipment and containers			
Products other than heat-cooking ware			
	Less than 1.1 L	0.5 $\mu\text{g/ml}$	2 $\mu\text{g/ml}$
	1.1 L and over and less than 3 L	0.25 $\mu\text{g/ml}$	1 $\mu\text{g/ml}$
	3 L and over	0.25 $\mu\text{g/ml}$	0.5 $\mu\text{g/ml}$
	Heat-cooking ware	0.05 $\mu\text{g/ml}$	0.5 $\mu\text{g/ml}$
Enamel equipment and containers			
	Products other than heat-cooking ware and whose capacity is less than 3 L	0.07 $\mu\text{g/ml}$	0.8 $\mu\text{g/ml}$
	Heat-cooking ware with the capacity of less than 3 L	0.07 $\mu\text{g/ml}$	0.4 $\mu\text{g/ml}$

B. Products that cannot be filled with liquid, products that can contain liquid less than 2.5 cm depth, or enameled products with the internal capacity of 3 L and over.

(1) Preparation of test solutions

Wash the sample well with water and then fill it with 4% acetic acid aqueous solution, and allow to stand at room temperature in a dark place for 24 hours. Transfer the acetic acid into a beaker, and use as the test solution. For enameled products with the internal capacity of 3 L and over, prepare flat pieces of the test sample and use it as test sample.

(2) Migration test

a. Cadmium and lead

i. Generation of the calibration curve

Dilute Cadmium Standard Solution and Lead Standard Solution with 4% acetic acid into appropriate concentrations. Determine the concentrations of cadmium and lead in these solutions by atomic absorption spectrophotometry or inductively coupled plasma atomic emission spectrometry, and prepare calibration curves respectively.

ii. Quantification

Determine the concentration (C µg/ml) of cadmium and lead respectively in the test solution by atomic absorption spectrophotometry or inductively coupled plasma atomic emission spectrometry. Obtain the amount of migration per unit area for each element by the formula given below, in which the surface area of the sample product is expressed as S (cm²) and the total volume of the solution used to elute the element as V (ml). The amount leached per unit area shall be equal to or less than the limits given in Columns 2 for cadmium and Column 3 for lead, for corresponding category given in Column 1 of the following table.

$$\text{Amount of migration per unit area } (\mu\text{g}/\text{cm}^2) = (C \times V)/S$$

Column 1		Column 2 (Cd)	Column 3 (Pb)
Glass equipment and containers		0.7 µg/cm ²	8 µg/cm ²
Ceramic equipment and containers		0.7 µg/cm ²	8 µg/cm ²
Enamel equipment and containers			
	Products that can contain a liquid 2.5 cm or more deep and whose capacity is not less than 3 L	0.5 µg/cm ²	1 µg/cm ²
	Products that cannot contain a liquid or products that can contain a liquid less than 2.5 cm deep		
	Products other than heat-cooking ware	0.7 µg/cm ²	8 µg/cm ²
	Heat-cooking ware	0.5 µg/cm ²	1 µg/cm ²