



**NATIONAL STANDARD OF THE
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Determination of total concentration of certain elements in toys

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1.1 This Standard specifies the sampling, digestion and instrumental analysis

methods for the determination of the total concentration of certain elements of antimony, arsenic, barium, cadmium, chromium, lead, mercury and selenium in toy materials and toy parts.

Note: Other certain elements, after verification, can be determined with reference to the test methods of this Standard. Manufacturers are encouraged to apply the test methods of this Standard and the limits from GB 6675.4-2014 to raw materials used in the manufacture of toys to give increased certainty of conformity to the requirements of GB 6675.4-2014.

1.2 This Standard applies to the following types of toy materials:

- coatings of paints, varnishes, lacquers, printing inks, polymers, and similar coatings;
- polymeric and similar materials, including laminates, whether textile-reinforced or not, but excluding other textiles;
- paper, paperboard, and cardboard;

- natural or synthetic textiles;
- metallic materials whether coated or not;
- other dip dyeable materials, whether mass-coloured or not (e.g. wood, fibreboard, hardboard, bone, and leather);
- materials intended to leave a trace (e.g. the graphite materials in pencils and liquid ink in pens);
- pliable modelling materials, including modelling clays and gels;

metallic particles or not, no matter how they have been applied to the toy.

Note: This definition includes metallic coatings deposited on a metal surface such as an electroplated coating. However, electroplating will only require testing if it can be removed by scraping (3.6); otherwise, it may be tested with the base material.

3.3 Laboratory sample Product either in the form in which it is marketed, or in the form in which it is intended to be marketed.

3.4 Test portion Single material taken from an accessible part of a laboratory sample (3.3).

3.5 Composite test portion Test portion that is composed of more than one similar material type.

Note: This definition excludes the mixing of different types of materials, such as not allowing the mixing of textiles and paint coatings.

3.6 Scraping Mechanical process for removal of coatings (3.2) down to the base material (3.1).

3.7 Complete digestion Complete breakdown of the test portion.

3.8 Sample blank Solution that has undergone the same digestion processes used for the digestion of test portions (3.4) and consists of all reagents excluding the test portion.

5.2.2 Inductively coupled plasma mass spectrometer (ICP-MS).

5.2.3 Inductively coupled plasma emission spectrometer (ICP-OES).

5.2.4 Microwave digestion system, equipped with sample holder and digestion vessel. The digestion vessel is a closed vessel suitable for microwave digestion.

It is advisable to use a digestion vessel that can withstand a temperature of at least 225 °C and an internal pressure of at least 3000 kPa. The liner of the vessel shall be PTFE (polytetrafluoroethylene)/TFM

[tris-(alpha-trifluoromethyl-beta,beta-difluorovinyl)-1,3,5-enzenetricarboxylate], or PTFE/PFA (perfluoroalkoxy ethylene) or another chemically inert material. Vessels shall also be equipped with a safety relief valve or disc that will prevent vessel rupture or ejection

of the vessel cap.

Note 1: Some new microwave digestion systems do not need to use high-pressure digestion vessels. As long as they can achieve the same digestion effect, these systems can also be used.

Note 2: For microwave digestion systems of different models and different manufacturers used in different laboratories, there may be many different and specific safety guidelines and operating recommendations. Operators need to, according to the equipment manual, and the safety operation guidelines provided by the manufacturer or related to the literature, correctly operate and use microwave digestion equipment and digestion vessel (see A.3, precautions for microwave digestion).

Note 3: The inner liners shall be inspected regularly to check for any chemical or physical degradation.

Note 4: Internal pressures in excess of 3000 kPa can occur with some samples, e.g. crayons, and so a suitable pressure-rated vessel, e.g. 5000 kPa, should be used in these cases.

5.2.5 Electric hot plate. The surface temperature can reach at least 140 °C.

Note: Provided that the hot plate is capable of handling the extra heating required, use of a 12 mm to 25 mm thick heat-resistant glass plate placed on the hot plate can help reduce the presence of hot spots common to electric hot plates.

5.2.6 Graphite digester, heatable sleeve device with temperature adjustment function (equipment with programmed setting or temperature rising function can be selected). Heating temperature can reach at least 140 °C. It is equipped with a suitable digestion container.

5.2.7 Scalpel, or other suitable scraping or cutting tools.

7 Preparation of test portions

7.1 Coatings of paint, varnish, lacquer, printing ink, polymer and similar coatings At room temperature, the coating is obtained from the toy sample by scraping;

take care to avoid scraping the base material. Where lithographic coatings (dot printing) are present, it is impractical to separate the individual colours and so select a representative test portion. Under the condition of not exceeding the ambient temperature, the sample is divided into small pieces with a length of no more than 2 mm in any direction, to facilitate the digestion.

Some coatings deposited on non-polymeric base material are more difficult to scratch. It is permissible to add a few drops of solvent, such as methylene chloride (5.1.6) or acetone/ethanol solution (5.1.7), to soften the coating and facilitate scraping.

If a solvent treatment is used, it shall make sure that all solvents remaining in the sample are completely removed by evaporation before weighing.

7.2 Polymeric and similar materials, including laminates, whether textile-reinforced or not, but excluding other textiles Scrape-off, cut, or grind the clean, dry material into pieces having a maximum length in any dimension of 2 mm using a scalpel or other suitable scraping or cutting tool.

7.3 Paper, paperboard and cardboard Cut the material into pieces with a maximum length in any dimension of 2 mm using a suitable cutting tool.

If the paper or paperboard to be tested is coated with paint, varnish, lacquer, printing ink, adhesive, or similar coating, test portions of the coating shall not be taken separately. In such cases, take test portions from the material so that they also include representative parts of the coated area. Material that is printed, where the ink has become part of the base material, is prepared as though they are unprinted.

7.4 Natural or synthetic textiles Cut the material into pieces having a maximum length in any dimension of 2 mm using a suitable cutting tool. The material or colour with a mass of 10 mg~100 mg shall be taken as part of the test portion obtained from the main material; shall be tested separately as a test portion different from the main tested in the dry or liquid state.

7.9 Metallic materials whether or not coated First, according to GB 6675.2, carry out small parts test on toys or components.

If the toy or toy component can be completely accommodated in small parts instrument and contains accessible metallic materials, the metallic materials shall be tested.

Using suitable cutting and grinding tools, obtain a test portion of between 10 mg and 100 mg.

Where practical, obtain the test portion from an uncoated part of the metallic material. If the metal part is coated, remove any coatings (including electroplated coatings) that can be scraped off. Electroplating that cannot be removed by scraping shall be tested together with the metallic base material.

Materials less than 10 mg are exempt from testing (see 6.1, selection of test portions), and are indicated in the report [see Clause 12 c)].

8 Digestion and analysis of test portions

8.1 General Clause 8 provides three digestion methods: microwave digestion (8.2), electric hot plate and graphite digester digestion (8.3). Digestion of samples with electric hot plate and graphite digester shall be carried out in a fume hood. 8.2 (microwave digestion) and 8.3 (electric hot plate and graphite digester digestion)

describe that, how to use aqua regia [3 parts of hydrochloric acid (5.1.4) and 1 part of nitric