



Summary on Chemicals in Toys Policy in China March 2020

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Key laws, regulations and standards on chemicals in toys

Laws and Regulations	<p>The Product Quality Law of the People’s Republic of China http://gkml.samr.gov.cn/nsjg/fqs/201906/t20190625_302770.html</p>
	<p>The Law of the People's Republic of China on Import and Export Commodity Inspection http://gkml.samr.gov.cn/nsjg/bgt/202106/t20210608_330402.html</p>
	<p>The Provisions on the Administration of Compulsory Product Certification http://www.cnca.gov.cn/zw/bmgz/202006/t20200618_58608.shtml</p>
	<p>The Rules of Implementation for Compulsory Certification of Toy Products (six items) http://www.cnca.gov.cn/zw/gg/gg2020/202007/W020200714314143062694.pdf</p>
	<p>The Measures for the Inspection, Supervision and Administration of Imported and Exported Toys http://dpac.samr.gov.cn/flfg/gnfg/202003/t20200311_89883.html</p>
Mandatory National Standards	<p>GB 6675 Toys Safety National Technical Standards http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=817AB173D94AB527D94BAFA8131E633A http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=DB14A63778AA076E4F30B44829D6BAEC http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=D3970AD46E33A0BDD5111A21CBCCC180 http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=91BB61618B785A7E82FCB51FF58200EC</p>
	<p>GB 24613 Limit of harmful substances of coatings for toys http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=B479D116E80C8C4B89D18DC8765C0AC6</p>
	<p>GB 26387 Safety of toys - Experimental sets for chemistry and related activities http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=4E2BEAFADD8FC5F638DDE1FF4F283B65</p>

ABBREVIATION

Abbr.	Term
BBP	Butyl benzyl phthalate
CAS	Chemical Abstracts Service
CCC	China Compulsory Certification
DBP	Dibutyl phthalate
DEHP	Di (2-ethyl) hexyl phthalate
DIDP	Diisodecyl phthalate
DINP	Diisononyl phthalate
DMDM	Hydantoin
DNOP	Di-n-octyl phthalate
EINECS	European Inventory of Existing Commercial Chemical Substances
GACC	General Administration of Customs
IUPAC	International Union of Pure and Applied Chemistry
MPA	1-Methoxy-2-propyl acetate
MIIT	Ministry of Industry and Information Technology
PM	1-Methoxy-2-propanol
REACH	Registration, Evaluation and Authorization of Chemicals
SAC	Standardization Administration of the People's Republic of China
SAMR	State Administration for Market Regulation
VOC	Volatile organic compounds

China is one of the largest producers, exporters and consumers of toy products in the world. In order to ensure the quality and safety of toys, and to promote the development of toys industry, China implements a series of related laws, regulations and standards, with many authorities participate in the supervision and management of toys industry.

Sections 1 summarize the laws and regulations related to toys are more general, while the standards make more specific regulations on toys from different aspects. The major existing standards related to toys can be divided into two standards; (i) National standards, (ii) Sector standards. Among them, only mandatory national standards set to specific provisions of chemicals in toys. Section 2 reviewed the chemical limits in toys and toy parts.

However, there are still gaps between China and the European Union in terms of the limits of chemicals in toys and the management of new chemicals may be containing in toys. Also, there is a need to improve the quality supervision to reduce use of chemicals based recall toys.

1 Introduction	1
1.1 An overview of toys management in China	3
1.1.1 Authorities involved in toys management	3
1.1.2 Legislations, laws and regulations on toys	4
1.1.3 Standards on Toys	6
1.2 Standards regulating chemicals in toys	7
2 Review of the existing regulations and standards	8
2.1 General limits of migratable elements and plasticizers	8
2.2 Chemicals in certain toys or toy parts	10
2.2.1 Chemical toys (sets) other than experimental sets	10
2.2.2 Finger paints	17
2.2.3 Coatings for toys	22
2.2.4 Experimental sets for chemistry and related activities ...	23
3 Conclusion	27

1 INTRODUCTION

The toy manufacturing is one of most traditional industry in China. After years of rapid development, China has become one of the largest producers, exporters and consumers of toys in the world.

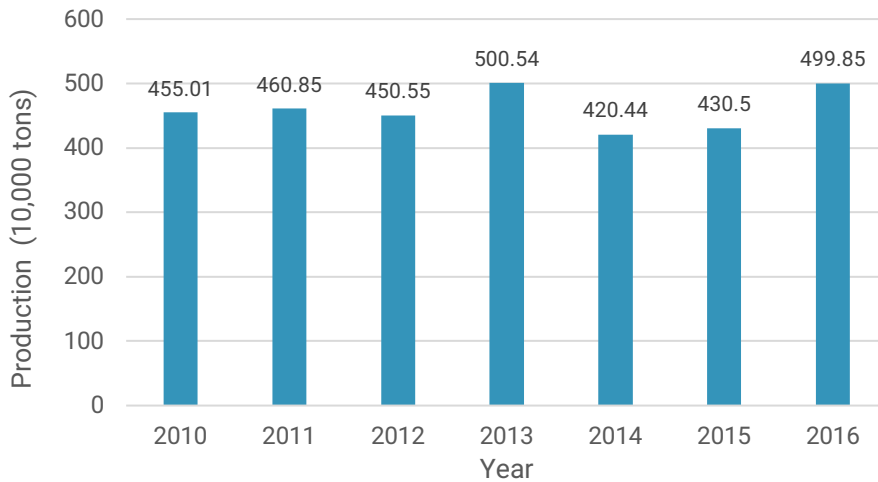


Figure 1: Production of toys in China¹

According to Figure 1, China produces approximately 5 million tons of toys.

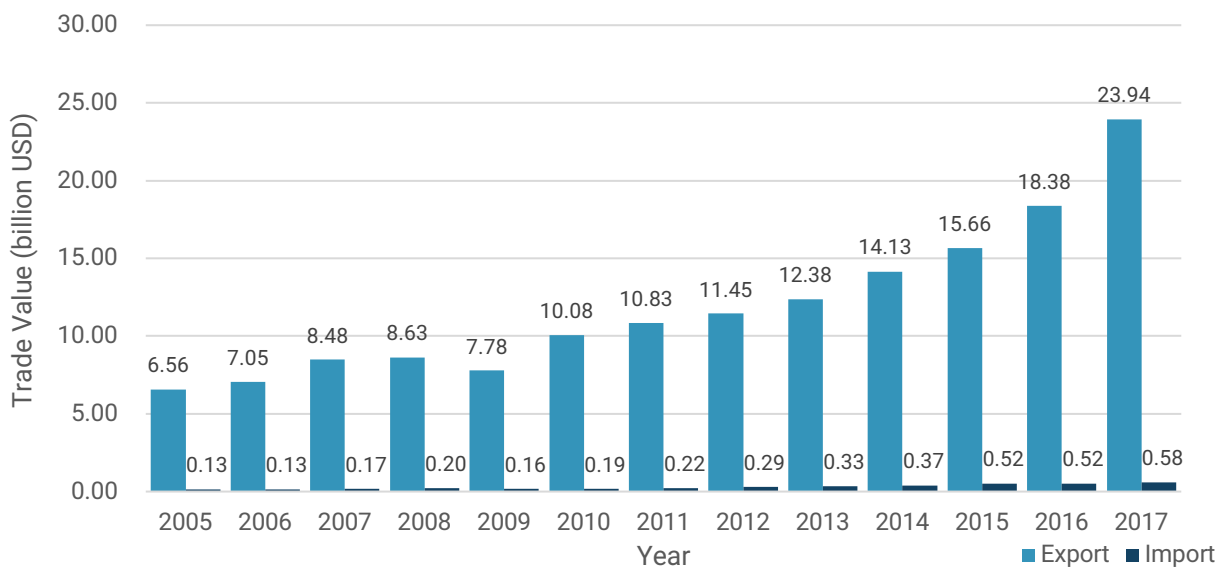


Figure 2: Import & export value of traditional toys in China²

¹ Data source: Internet + toy market output analysis and development risk report in China in 2018-2024. <https://www.chyx.com/research/201801/602502.html>.

² Data source: National Bureau of Statistics of China. <http://data.stats.gov.cn/>.

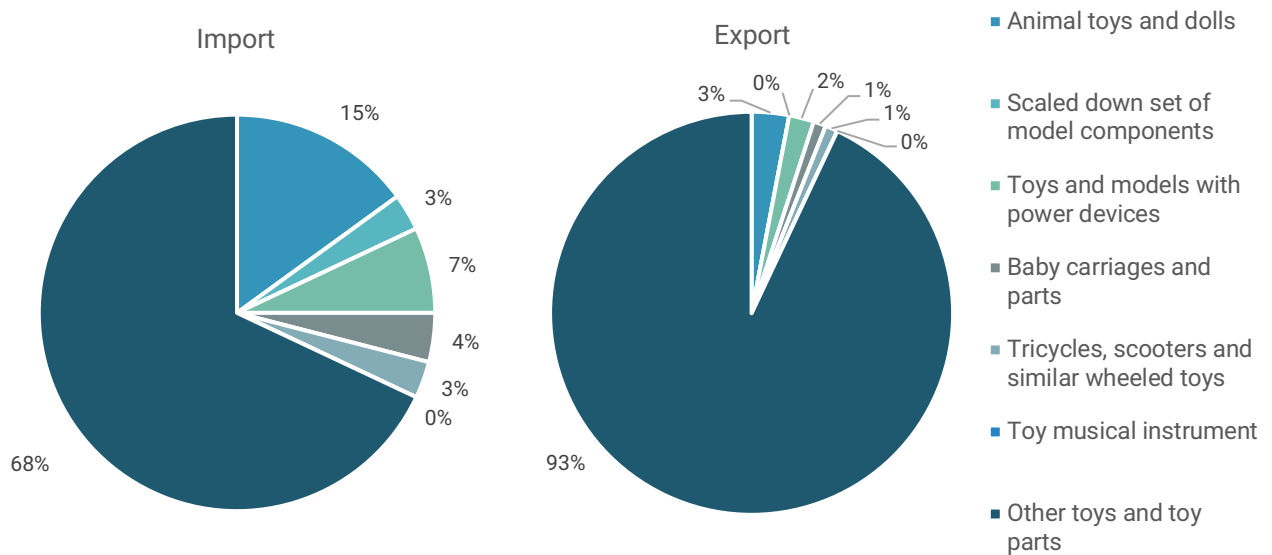


Figure 3: China's traditional toy imports and exports in 2017³

Toys industry is one of the key sectors of China's export. In 2018, the trade value of toys, games and sports requisites; parts and accessories thereof in China is 56.1 billion US dollars⁴, counting for 48.3% of total trade value of global export⁵. As for traditional toys⁶, China's export value of toys has been rapidly increasing, and reached 25 billion US dollars in 2018. According to data showing in Figure 3, among all types of traditional toys, Animal toys, dolls and toys & models with power devices are the most popular ones being imported and exported.

China's toy sales have grown significantly in recent years. In 2017, the retail scale of China's toy market reached 64.63 billion yuan (~9.23 billion US dollars), with a year-on-year increase of 16.24%. Online sales accounted for 23.5% and offline sales accounted for 76.5%⁷.

With great importance to the toy industry, there are series of regulations and standards implemented in order to systematically manage toy industry in China. The regulations and standards cover a number of aspects of toys, including quality, safety, testing methods, import and export, certification rules, etc. These regulations and standards play a crucial role in the management and development of toy industry in China.

³ Data source: Wang, Shicheng. *China Light Industry Yearbook*. Beijing: China Light Industry Yearbook Press, 2018: 467-484.

⁴ Data source: General Administration of Customs, P.R.China. <http://43.248.49.97/indexEn>. To make the data comparable worldwide, herein uses export value of products with HS commodity code of 95- Toys, games and sports requisites; parts and accessories thereof.

⁵ Data source: UN Comtrade. <https://comtrade.un.org/data/>. The term "toys" as used herein refers to products with HS commodity code of 95.

⁶ The term "traditional toys" used herein refers to products with HS commodity code of 95030010, 95030021, 95030029, 95030060, 95030083, 95030089 and 95030090.

⁷ Data source: Wang, Shicheng. *China Light Industry Yearbook*. Beijing: China Light Industry Yearbook Press, 2018: 220-222.

1.1 AN OVERVIEW OF TOYS MANAGEMENT IN CHINA

1.1.1 AUTHORITIES TAKE PART MANAGEMENT OF TOYS

The State Administration for Market Regulation (SAMR)⁸, the Ministry of Industry and Information Technology (MIIT), and the General Administration of Customs (GACC) are the most important authorities taking part in the quality monitoring and the planning & introducing different regulations and standards in China.

The SAMR is the authority in charge of the quality monitoring of toy products. The SAMR is mainly responsible for various specific work such as, (1) quality supervision, inspection and quarantine; (2) technical specifications related to quality supervision, inspection and quarantine; (3) the formulation of the catalog of entry-exit inspection and quarantine commodities; the legal inspection, supervision and governance of import and export commodities; (5) the supervision and governance of the identification of import and export commodities and the verification of import and export commodities under the national licensing system; and (6) administration of quarantine marks of the entry-exit inspection, import and export safety and quality licensing and export quality licensing. The Standardization Administration of the People's Republic of China (SAC) is an administration in SAMR. SAC mainly takes the responsibility for issuing standards, coordinating the work of standards setting, participating in global and regional standardization organizations and so on.

The MIIT is the authority in charge of the regulations and standards making. The MIIT is mainly responsible for: (1) making and implementing industry schemes, industrial policies & standards; (2) monitoring the operation of industries; (3) promoting the improvement of major technical equipment and independent innovation and so on. As an industry management department, the MIIT manages schemes, policies and standards and guides the development of the industry without interference in its production and operation activities.

The GACC is an authority in charge of the import and export of toy products. The GACC is mainly responsible for: (1) inspection of import and export commodities; (2) supervision and management of the identification, verification, quality and safety of import and export commodities; (3) collection of national import and export goods trade and other customs statistics, establishment of public information service platform for import and export enterprises and so on.

⁸ The State Administration for Market Regulation (SAMR) is the former General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China.

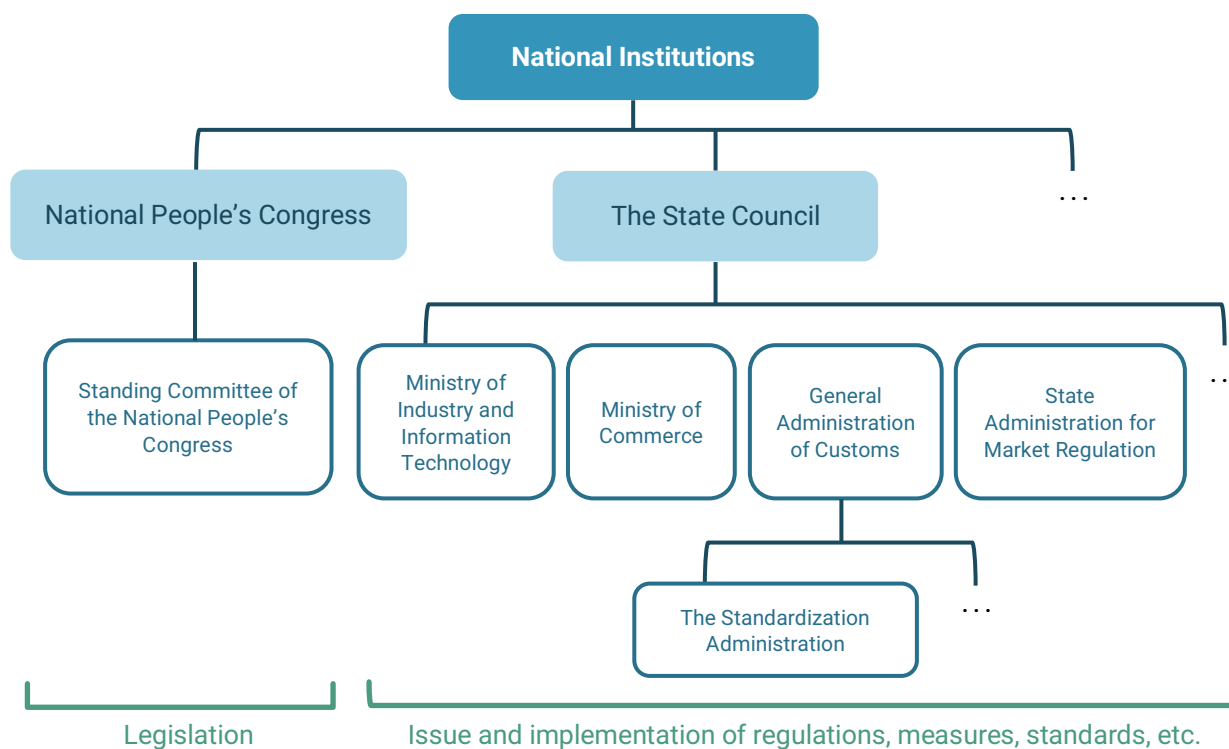


Figure 4: Institutes involved in management of toys.

Besides, there are other ministries or administrations for example, the Ministry of Commerce contributing to the management of toys in China.

1.1.2 LEGISLATIONS, REGULATIONS ON TOYS

For the safety supervision of toy products in China, there are some legal basis, mainly the ***Product Quality Law of the People's Republic of China*** and the ***Law of the People's Republic of China on Import and Export Commodity Inspection***.

In this context, a series of regulations and standards are enacted based on these laws to further clarify the rules for toys and toy industry in China. The most important ones are the ***Provisions on the Administration of Compulsory Product Certification***, the ***Rules of Implementation for Compulsory Certification of Toy Products (six items)***, the ***Measures for the Inspection, Supervision and Administration of Imported and Exported Toys***, ***GB 6675 National Toys Safety Technical Standards*** and ***Administrative Provisions on the Recall of Children's Toys***.

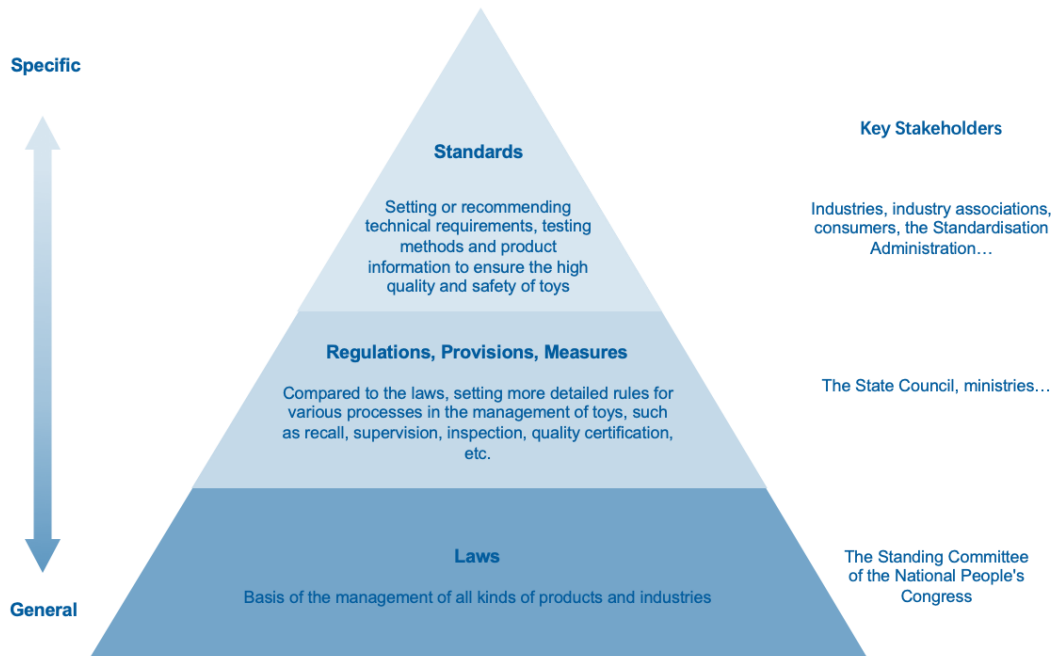


Figure 5: Relationship between laws, regulations and standards

According to the *Provisions on the Administration of Compulsory Product Certification* and the *Rules of Implementation for Compulsory Certification of Toy Products (six items)*, in this context, China is currently implementing the program China Compulsory Certification (CCC) system for six categories of toy products, namely includes children's cars, electric toys, plastic toys, metal toys, doll toys and ejection toys. In order to further protect the safety of children, the SAMR has issued the Regulations on the Administration of Children's Toys Recall on August 27, 2007, which required to the producers to eliminate the possible injuries caused by the defects of children's toys through effective ways.

In March 2009, SAMR issued the *Measures for the Inspection, Supervision and Administration of Imported and Exported Toys*, which was later updated in 2018. It is specified that imported toys shall be inspected in accordance with the compulsory requirements of China's national technical specifications, and exported toys shall be tested in accordance with the technical regulations and standards of the importing countries or regions.

1.1.3 STANDARDS ON TOYS

Major current standards on toys can be divided into two parts (i) national standards, and (ii) sector standards. There are 31 national standards (5 mandatory standards and 26 voluntary standards) and 48 sector standards on toys.

The mandatory national standards include:

- 1) **GB 6675 Toys Safety National Technical Standards** specify the basic rules, mechanical and physical properties, flammability and migration of certain elements of toys, as well as the technical specifications of toy sets, finger paints, experimental toys and other specific toys.
- 2) **GB 24613 Limit of harmful substances of coatings for toys** specify the limit of harmful substances, for example- phthalates and soluble elements and volatile organic compounds.
- 3) **GB 26387 Safety of toys - Experimental sets for chemistry and related activities** regulates the limit of specific chemicals in toys.
- 4) **GB 19865 Safety of electric toys** sets standards for electric toys.
- 5) **GB 5296.5-2006 Instructions for use of products of consumer interest - Part 5: Toys** specify the instructions for the use of toy products.

There are voluntary national standards, which are not compulsory, but supplements the mandatory national standards. The voluntary national standards include the technical or safety standards (7 standards) for certain types of toys (bamboo & wood toys, plush & cloth toys, inflatable toys) and certain toy parts (coating, coating, filler, electrical parts), test methods (14 standards) for specific chemical content or physical properties, and other relevant standards (5 standards) for instance product information, signs etc. These standards do not involve the provisions of the content of chemicals in toys.

The sector standards are made based on national standards of toys. These standards include determination methods for chemical substances and physical properties of toys (32 standards), technical standards for import and export toys (4 standards) and technical standards for specific toys (electric toys, wooden toys, inflatable toys, clockwork toys etc.) and toy parts (12 standards). In the sector standards, there is no additional regulation on chemical content of toys.

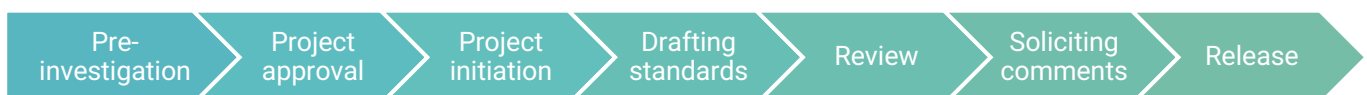


Figure 6: Procedure of the launch of standards

1.2 STANDARDS REGULATING CHEMICALS IN TOYS

The standards regulating chemicals in toys among the above standards are:

GB 6675.1 Toys Safety - Part 1: Basic code specifies the basic safety requirement for toys, its implementation and supervision, legal responsibilities, etc. Basic safety requirement consists of mechanical and physical properties, flammability, chemical properties, electrical properties, hygienic requirements, radiation properties and labeling requirements. This part applies to toys designed or intended for children under 14 years old to play and products for children under the age of 14 years old that are not specifically designed for playing but have this function.

GB 6675.4 Toys Safety - Part 4: Migration of certain elements specifies maximum limit requirements, sampling methods, and test sample preparation and extraction procedures of the migratable elements (antimony, arsenic, barium, cadmium, chromium, lead, mercury and selenium) in toy materials and toy parts.

GB 6675.13 Safety of toys - Part 13: Chemical toys (sets) other than experimental sets specifies requirements and test methods for substances and materials in chemical toys (sets) other than experimental sets. This part applies to plaster moulding sets, ceramic and vitreous enameling materials supplied in miniature workshop set, oven hardening plasticized PVC-modelling clay set, plastic moulding sets, embedding set, photographic developing set and adhesives, paints, varnishes, thinners and cleaning agents (solvents) provided or recommended in the model set.

GB 6675.14 Safety of toys - Part 14: Requirements and test methods of finger paints specifies requirements and test methods of finger paints for the use of children under the age 14 years old. This part applies to substances and materials in finger paints used by children under 14 but not to components and materials apart from finger paints among finger paint products.

GB 26387 Safety of toys - Experimental sets for chemistry and related activities specifies the specific substances and preparations to be used in laboratory toys for chemical and similar activities and their maximum dosage, as well as the requirements for labelling, list of contents, instructions for use and equipment to be used for testing. This standard applies to chemical experimental sets and their supplementary sets.

GB 24613 Limit of harmful substances of coatings for toys prescribes requirements on limits, test methods, inspection and packaging marks of substances that are harmful to human body and environment in coatings used for toys. The standard applies to coatings for every category of toys.

2 REVIEW OF THE EXISTING REGULATIONS AND STANDARDS

To date, China has already implemented a number of standards to regulate the chemical content and standard limits in toys. Limits herein refer to the restriction of specific amount or concentration of the chemicals permissible limit in toys. In order to prevent the negative health impacts of certain chemicals, limits (mostly maximum limits) are set to ensure the safety of toys. However, minimum limits are usually set to ensure the function of toys. Therefore, chemicals that are limited in toys are discussed in this section, although if chemicals that are allowed without limits are excluded.

According to the existing regulations and standards, the limits of chemicals in toys are itemized as follows:

2.1 GENERAL LIMITS OF MIGRATABLE ELEMENTS AND PLASTICIZERS

The exposure to chemical substances caused either by normal use or mismanagement test of toy products, it should make sure that, there will be no negative impacts on human health. The materials used in toy products should fulfil national laws and regulations for products in certain areas or banned dangerous substances. Migratable elements (Sb, As, Ba, Cd, Cr, Pb, Hg and Se) in materials and components in toy products for specific age groups should not exceed the maximum permissible limits as listed in Table 1.

Table 1: Maximum limits of migratable elements in toy products

Toy materials	Element Content Limits / (mg / kg toy material)							
	Sb	As	Ba	Cd	Cr	Pb	Hg	Se
Finger paints ⁹	10	10	350	15	25	25	10	50
Modeling clay	60	25	250	50	25	90	25	500
Others (except modeling clay & finger paints)	60	25	1000	75	60	90	60	500

⁹ The coloring materials in the form of clay or gel, designed for children to paint directly on object surface with hands or fingers. The major ingredients in finger paints include colorant, extender, binding agent, humectant, preservative, surfactant and embittering agent apart from water.

Toy products shall **use safe plastic additives. Contents of 6 plasticizers for plasticized materials in accessible toy materials and parts must not exceed the limit requirements in Table 2.**

Table 2: Types and limits of limited plasticizers

Scope	Limited plasticizer types and corresponding Chemical Abstracts Service (CAS) Number (No.)		Limits/%
All products including products can be put into mouth	Dibutyl phthalate (DBP)	84-74-2	Total content of three plasticizers ≤ 0.1
	Butyl benzyl phthalate (BBP)	85-68-7	
	Di (2-ethyl) hexyl phthalate (DEHP)	117-81-7	
Products can be put into mouth	Di-n-octyl phthalate (DNOP)	117-84-0	Total content of three plasticizers ≤ 0.1
	Diisononyl phthalate (DINP)	68515-48-0	
		28553-12-0	
	Diisodecyl phthalate (DIDP)	26761-40-0	
		68515-49-1	

Note: It is exempted when a single sample of a single material is less than 10 mg.

2.2 CHEMICALS IN CERTAIN TOYS OR TOY PARTS

2.2.1 CHEMICAL TOYS (SETS) OTHER THAN EXPERIMENTAL SETS

2.2.1.1 CERAMIC AND VITREOUS ENAMELLING MATERIALS SUPPLIED IN MINIATURE WORKSHOP SET¹⁰

These materials are a mixture of silicate glazes with metal oxides and other compounds as listed in Table 3. The maximum mass shall not exceed 50g/each set of preparation.

Table 3: Chemical preparations

Chemical substances/preparations	CAS	EINECS ^a
Hydrated calcium silicate (clay)	1344-96-3	—
Kaolin (porcelain clay)	1332-58-7	—
Slightly soluble silicate enamel, such as ceramic frits	65997-18-4	266-047-6
Only the following pigments are used in these enamels:		
Cupric oxide ≤ 0.25%	1317-38-0	215-269-1
Fe ₂ O ₃ ≤ 5%	1309-37-1	215-168-2
Ferrozircon silicate ≤ 5%	68412-79-3	270-210-7
Two tin oxide ≤ 10%	18282-10-5	242-159-0
Zirconium vanadium silicate ≤ 5%	68186-95-8	269-0057-9
Aluminum cobalt oxide ≤ 3%	1333-88-6	—
Zirconium silicate ≤ 15%	10101-52-7	—
Praseodymium zirconium silicate ≤ 5%	68187-15-5	269-075-7

^a European Inventory of Existing Commercial chemical Substances (EINECS) is an inventory of substances that were deemed to be on the European Community market between 1 January 1971 and 18 September 1981.

¹⁰ Toys containing ceramic and vitreous enameling materials (transparent, opaque or colored), which are added to water and then coated on the surface of ceramic and metal objects to form a smooth coating, and then dried to 700 °C for firing.

2.2.1.2 OVEN HARDENING PLASTICIZED PVC-MODELLING CLAY SET¹¹

Only some of the plasticizers can be used as listed in Table 4.

While, the maximum content shall not exceed 30% for plasticizer in preparation. The content of vinyl chloride monomer is less than 1 mg/kg.

Table 4: Plasticizer

Chemical substances	CAS	EINECS
Adipate polyester	—	—
Alkylsulfonate of phenol (C ₁₂ -C ₂₀)	—	—
Phthalates of straight chain fatty alcohols (above C ₆) and their esters	—	—
Tributyl acetylacrylate	77-90-7	201-067-0
Tris (2-ethylhexyl) acetylacrylate	144-15-0	205-617-0

2.2.1.3 PLASTIC MOULDING SET¹²

Plastic moulding sets shall contain polystyrene particles with and without colour (Table 5).

Table 5: Polystyrene

Chemical substances	CAS	EINECS
Polystyrene containing less than 500 mg/kg polystyrene monomer	9003-53-6	—

¹¹ Toys used to make various types of figures, brooches, popular jewelry, etc. are prepared by curing in an oven with a temperature between 100 - 130 °C.

¹² Toys used to replace ceramic materials to make ornaments or models are prepared by polymer fusion when heated in an oven with a maximum temperature of no more than 180 °C.

2.2.1.4 PHOTOGRAPHIC DEVELOPING SET¹³

Only the substances and accessories can be used in the black-and-white photo set, and the maximum quantity specified cannot be exceeded (Table 6). These quantities are calculated based on being able to develop 4 batches of solution, 0.5 L each.

Table 6: Maximum concentration of chemical substances

Substances	Maximum concentration/Set	CAS	EINECS
Acetic acid 7% (volume fraction)	100 mL	64-19-7	200-580-7
Ammonia thiosulfate	4 × 75 g	7783-18-8	2313-982-0
Ascorbic acid	4 × 10 g	50-81-7	200-066-2
Citric acid	5 g	77-92-9	201-069-1
Sodium pyrosulfite	4 × 10 g	7681-57-4	231-673-0
N - (4-hydroxyphenyl) - amino-acetic acid	4 × 5 g	122-87-2	204-580-8
P-methylaminophenol sulfate	4 × 5 g	55-55-0	200-237-1
Fenidone	4 × 1 g	92-43-3	202-155-1
Potassium bromide	4 × 0.5 g	7758-02-3	231-830-3
Sodium carbonate	4 × 20 g	497-19-8	207-838-8
Sodium sulfite	4 × 20 g	7757-83-7	231-821-4
Sodium thiosulfate	4 × 75 g	7772-98-7	231-867-5

Note: The quantity given refers to anhydrous chemicals. When an equivalent amount of aqueous chemical or its salt (if applicable), it may have different CAS numbers and EINECS numbers, which can replace the anhydrous chemical.

¹³ Toys that contain chemicals (developer, stop developer, fixer) to process black and white photographic film and photos and design to teach the fundamentals of photography.

2.2.1.5 ADHESIVES, PAINTS, LACQUERS, VARNISHES, THINNERS AND CLEANING AGENTS SUPPLIED OR RECOMMENDED IN MODEL SETS¹⁴

Special additives of **liquid adhesives for paper and wood** shall meet the requirements of Table 7.

Table 7: Special additives of liquid adhesives for paper and wood

Chemical substances	CAS	EINECS
Ethyl glycolate < 3%	7397-62-8	230-991-7
Caprolactam < 5%	105-60-2	203-313-2
Glycerol	56-81-5	200-289-5
Polyacrylamide	9003-05-8	—
Polyacrylic acid	9003-01-4	—
Polyethylene glycol	25322-68-3	—
Polymethylacrylic acid	25087-26-7	—
Propyl glycol	25322-69-4	—
Sodium salt of fatty acid (above C14)	—	—
Sorbitol	50-70-4	200-061-5
Diethylene glycol butyl ether acetate < 3%	124-17-4	204-685-9
Xylitol	87-99-0	201-788-0

The polymers (as listed Table 7) shall meet the requirements of laws, regulations and national standards of plastic materials and articles for contact with food. The volume of the water-based adhesive packaging container in a set should not exceed 100 ml.

¹⁴ Products used to assemble and film models (such as cars, airplanes, houses, ships).

The content of plasticizers in **solvent-based adhesives** should not exceed 8%; the content of regulators should not exceed 3%.

The solvent of the special solvent-based adhesive shall meet the requirements of Table 8.

Table 8: Solvent

Chemical material	CAS	EINECS
Acetone	67-64-1	200-662-2
Cyclohexane	110-82-7	203-806-2
3-pentanone	96-22-0	202-490-3
Ethyl acetate	141-78-6	205-500-4
Ethanol	64-17-5	200-578-6
Isopropyl acetate	108-21-4	203-561-1
Isopropanol	67-63-0	200-661-7
Methyl acetate	79-20-9	201-185-2
Methyl ethyl ketone	78-93-3	201-159-0
Methyl isopropyl ketone	563-80-4	209-264-3
N-butyl acetate	123-86-4	204-658-1
N-propyl acetate	109-60-4	203-686-1
1-methoxy-2-propanol	107-98-2	203-539-1
1,1 dimethoxyethane	534-15-6	208-589-8
Petroleum fraction (60 °C ~ 140 °C) (The maximum content of n-hexane is 5%)	64742-89-8	265-192-2
Petroleum fraction (135 °C ~ 210 °C) (The maximum content of n-hexane is 5%)	64742-88-7	201-185-2

The maximum content of 1-methoxy-2-propanol should not exceed 20%. The volume of the packaging container in a set should not exceed 15 g.

The content of organic solvents and film-forming agents in **water-based paints and lacquers** should not exceed 10%. In addition, for short-term use, only the preservatives can be allowed in food and cosmetics specified in GB 2760 and "Cosmetic Hygiene Regulations" can be used.

Table 9: Organic solvents and film formers in water-based paints and lacquers

Chemical substances / preparations	CAS	EINECS
Fatty acid (c20-c33) di (2-methylpropyl) ester (as film forming agent, the maximum content is 2%)	—	—
Ethanol	64-17-5	200-578-6
Mixture of fatty acid ester and alcohol (c12-c14) (the maximum content as film forming agent is 2%)	—	—
1-methoxy-2-propanol	107-98-2	203-539-1
1,2-propanediol	57-55-6	200-338-0
2-methyl-2, 4-pentanediol	107-41-5	203-489-0
2-propanol	67-63-0	200-661-7
Petroleum fraction (60-140 °C) (maximum content of n-hexane is 5%)	64742-89-8	265-192-2
Petroleum fraction (135-210 °C) (maximum content of n-hexane is 5%)	64742-88-7	265-191-7

The content of the packaging container in a package shall not exceed 100ml.

Solvent-based paints and varnishes shall include colorants, fillers, conditioners, base materials of Table 10 and solvents of Tables 9 and Table 11. The content of the regulator shall not exceed 3%.

For solvent-based paints and varnishes made from digested cellulose, the content of plasticizer shall not exceed 5%.

In addition to film forming agent, **diluent and cleaning agents** can only contain substances and preparations as per listed in Table 9 and Table 11. While, the paints and varnishes shall not contain more than 2% isobutanol or n-butanol and more than 20% 1-methoxy-2-propanol. Isobutanol, n-butanol and 1-methoxy-2-propanol cannot be used in diluents and detergents.

Table 10: Basic materials

Chemical substance	CAS	EINECS
Acrylic polymer	—	—
Alkyd resin polymer	—	—
Nitrocellulose	9004-70-0	—

Table 11: Solvents

Chemical substance / preparation	CAS	EINECS
Glyceryl triacetate	102-76-1	203-051-9
Isobutanol	78-83-1	201-148-0
Methyl ethyl ketone (2-butanone)	78-93-3	201-159-0
1-methoxy-2-propanol (PM)	107-98-2	203-539-1
Promethol-2-propanol acetate (MPA)	108-65-6	203-603-9
N-butanol	71-36-3	200-751-6
3-methoxy-n-butyl acetate	4435-53-4	224-644-9

The maximum capacity of the packaging container in a set shall not exceed:

- 15 mL for preparations with a flash point not exceeding 55 °C;
- 50 mL for preparations with a flash point exceeding 55 °C.

2.2.2 FINGER PAINTS

Finger paints shall not contain dangerous substances or preparation in order to avoid health impacts on children's who use finger paints.

Free primary aromatic amines listed in Table 12 must not be detected in finger paints.

Table 12: Primary amines must not be detected in finger paints

Name of primary aromatic amine	CAS
Benzidine	92-87-5
2-naphthylamine	91-59-8
2-chloro-2-methyl-aniline (4-chloro-o-toluidine)	95-69-2
4-aminobiphenyl	92-67-1

Apart from aromatic amines listed in Table 12, the total of primary aromatic amines in finger paints shall not be exceed 20 mg/kg, the quantity of any single aromatic amine shall not be exceed 10 mg/kg. While, this restriction does not apply to aromatic aminocarboxylic acids and sulfamic acids.

Table 13: Other primary aromatic amines of concern

Name of primary aromatic amine	CAS No.
o-aminoazotoluene (4-o-tolylazo-o-toluidine)	97-56-3
2-amino-4-nitro-toluene (5-nitro-o-toluidine)	99-55-8
4-chloroaniline	106-47-8
2,4-diaminodiphenylmethane	615-05-4
4,4'-diaminodiphenylmethane	101-77-9
3,3'-dichlorobenzidine	91-94-1
3,3'-dimethoxybenzidine	119-90-4
3,3'-dimethylbenzidine	119-93-7
3,3'-dimethyl-4,4'-diaminodiphenylemethane	838-88-0
p-cresidine (6-methoxy-m-toluidine)	120-71-8
2,2'-dichloro-4,4'-methylenedianiline (4,4'-methylene-bis-2-chloroaniline)	101-14-4
4,4'-oxydianiline	101-80-4
4,4'-thiodianiline	139-65-1
o-toluidine	95-53-4
2,4-xylydine	95-68-1
2,6-xylydine	87-62-7
4-amino-3-fluorophenol	399-95-1
2-methoxyaniline (o-anisidine)	90-04-0
4-aminoazobenzene	60-09-3
4-methl-m-phenylenediamine (toluene-2,4-diamine)	95-80-7
2,4,5-trimethylaniline	137-7-7
aniline	62-53-3

Finger paints shall not contain azo dyes that can form primary aromatic amines as listed in Table 12 and Table 13; by losing one or many azo groups in degradation.

Finger paints can only use preservatives listed in Table 14. The maximum limit, restrictions and requirements should be met as prescribed in Table 14.

Table 14: Preservatives allowed in finger paints

Substance	CAS No.	Maximum limit	Requirement
Benzoic acid, salts and esters ¹		0.5% (measured by acid)	
Propionic acid and its salts ¹		2% (measured by acid)	
Sorbic acid (hexa-2,4-dienoic acid) and its salts ¹	110-44-1	0.6% (measured by acid)	
Paraformaldehyde	30525-89-4	0.1% (measured by free aldehyde)	
2-Hydroxybiphenyl (ortho-phenylphenol) and its salts ¹	90-43-7	0.2% (measured by free aldehyde)	
Inorganic sulphites and hydrogen sulphites		0.2% (measured by free sulfur dioxide)	
4-Hydroxybenzoic acid and its salts and esters ¹		Single ester: 0.4% (measured by acid) Mixed ester: 0.8% (measured by acid)	
3-acetyl-6-methylpyran-2,4 (3H)-dione and its salts ¹		0.6% (measured by acid)	
Formic acid and its sodium salt ¹	64-18-6	0.5% (measured by acid)	
3,3'-Dibromo-4,4'-hexamethylene dioxydibenzamidine and its salts (including isethionate) ¹		0.1%	
Undec-10-enoic acid and salts ¹		0.2% (measured by acid)	
1,6-Di(4 amidinophenoxy)-n-hexane	3811-75-4	0.1%	
2-Bromo-2-nitro-1,3-propanediol	52-51-7	0.1%	Avoid forming nitrosamine
2,4-Dichlorobenzyl alcohol	1777-82-8	0.15%	

Substance	CAS No.	Maximum limit	Requirement
Triclocarban	101-20-2	0.2%	Purity criterion: 3,3',4,4'-tetrachloroazo benzene less than 1 mg/kg; 3,3',4,4'-tetrachloroazo xybenzene less than 1 mg/kg
Triclosan	3380-34-5	0.3%	
2,4-Dichloro-3,5-dimethylphenol	133-53-9	0.5%	
3,3'-Bis(1-hydroxymethyl-2,5-dio xoimidazolidin-4-yl)-1,1'-methyle nediurea		0.6%	
Poly(iminocarbonimidoyliminocarbon imidoylimino-1,6-hexanediyl) hydrochloride	32289-58-0	0.3%	
2-Phenoxyethanol	122-99-6	1.0%	
Hexamethylenetetramine	100-97-0	0.15%	
Methenamine 3-chloroallylochloride	4080-31-3	0.2%	
1-(4-chlorophenoxy)-1-(imidazol- 1-yl)-3,3-dimethylbutan-2-one	38083-17-9	0.5%	
Hydantoin (DMDM)	6440-58-0	0.6%	
Benzyl alcohol	100-51-6	1%	
1-Hydroxy-4-methyl-6(2,4,4-trime thylpentyl)2-pyridon and its monoethanolamine salt	68890-66-4	0.5%	
6,6-Dibromo-4,4-dichloro-2,2'-met hylene-diphenol	15435-29-7	0.1%	
4-isopropyl-3-methylphenol	3228-02-2	0.1%	
Clorofene	120-32-1	0.2%	
Chlorhexidine and its digluconate, diacetate and dihydrochloride		0.3% (indicated as chlorhexidine)	

Substance	CAS No.	Maximum limit	Requirement
Alkyl(C ₁₂ -C ₂₂) trimethyl ammonium, bromide and chloride		0.1%	
4,4-dimethyloxazolidine	51200-87-4	0.1%	pH of products must not be lower than 6
<i>N</i> -(Hydroxymethyl)- <i>N</i> -(dihydroxy methyl-1,3-dioxo-2,5-imidazolinidyl-4)- <i>N'</i> -(hydroxymethyl) urea	78491-02-8	0.5%	
1,6-di(4-amidinophenoxy)- <i>n</i> -hexane and its salts (including isethionate and <i>p</i> -hydroxybenzoate) ¹		0.1%	
3-(<i>p</i> -chlorophenoxy)-propane-1,2-diol	104-29-0	0.3%	
Sodium hydroxymethylglycinate	70161-44-3	0.3%	
Mixture of 5-chloro-2-methylisothiazol-3(2H)-one and 2-methylisothiazol-3(2H)-one with magnesium chloride and magnesium nitrate	55965-84-9	0.0015% (measured by 3:1 mixture of 5-chloro-2-methylisothiazol-3(2H)-one and 2-methylisothiazol-3(2H)-one)	

2.2.3 COATINGS FOR TOYS¹⁵

Harmful substances in coatings for toys should meet the standard limits prescribed in Table 15.

Table 15: Requirement for limits of harmful substances in coatings for toys

Item		Requirement
Content of Pb ^a (mg/kg) ≤		600
Content of soluble element ^a (mg/kg) ≤	Sb	60
	As	25
	Ba	1000
	Cd	75
	Cr	60
	Pb	90
	Hg	60
Content of Phthalate ^b (%) ≤	The total of Di (2-ethylhexyl) phthalate (DEHP), Dibutyl phthalate (DBP) and Butyl benzyl phthalate (BBP)	0.1
	The total of Diisononyl phthalate (DINP), Diisodecyl phthalate (DIDP) and Di-n-octyl phthalate (DNOP)	0.1
Content of Volatile Organic Compounds (VOC) ^c (g/L) ≤		720
Content of benzene ^c (%) ≤		0.3
Total content of toluene, ethylbenzene and dimethylbenzene ^c % ≤		30
<p>^a Prepare mixed sample as instructed on the product (no need of diluent) and prepare film of appropriate thickness.</p> <p>^b For liquid samples, prepare mixed sample as instructed on the product, measure the content with the prescribed method, then convert it to the content in the dry film. For powder sample or dry film sample, measure the content with the prescribed method.</p> <p>^c Only apply to solvent-based coatings. Prepare mixed sample as instructed on the product and measure the content. If the quantity of diluent is a range, measure with the greatest dilution.</p>		

¹⁵ The general term for liquid or solid coatings that can form a film when applied on the surface of toys.

2.2.4 EXPERIMENTAL SETS FOR CHEMISTRY AND RELATED ACTIVITIES

Only the chemical substances, preparations and indicators may be used for chemistry sets¹⁶ (see Table 16 and Table 17), and their use shall not exceed the limit specified. As for the indicators provided in the form of solution, the solid content of the indicators shall not exceed the limit specified in Table 17.

Table 16: Limits and risk categories of substances and preparations

Chemicals and preparations	Maximum limit per set of toys	Risk categories	CAS No. ^a
Aluminum potassium sulfate ^b	10g	-	10043-67-1
Ammonium sulfate ^g	5g	harmful	10361-29-2
Ammonium chloride	30g	harmful	12125-02-9
Ammonium ferric sulfate ^g	5g	pungency	10138-04-2
Sodium ammonium biphosphate	5g	-	13011-54-6
Calcium carbonate	100g	pungency	471-34-1
Calcium oxide	10g	pungency	10043-52-4
Calcium hydroxide ^{e,g}	20g	pungency	1305-62-0
Calcium nitrate ^g	5g	pungency, oxidative ^b	10124-37-5
Calcium oxide ^{e,g}	10g	corrosive ^h	1305-78-8
Calcium sulfate	100g	-	7778-18-9
Charcoal ^b	100g	-	7440-14-0
Citric acid ^g	20g	pungency	77-92-9
Clove oil ^{b,g,i}	10ml	harmful	84961-50-2
Copper sheet	100g	-	7440-50-8
Copper oxide (II) ^g	10g	harmful	1317-38-0
Copper sulfate (II) ^g	15g	harmful	7758-98-7
Sodium pyrosulfite	10g	harmful	7681-57-4
Glycerinum (water content \geq 15%)	25g	-	56-81-5
Hexamine (solid fuel)	10g	harmful inflammable solid ^h	100-97-0
Scrap iron /iron powder ^{b,g}	100g	inflammable solid ^h	7439-89-6
Ferric chloride ^g	10g	harmful	7705-08-0

¹⁶ Laboratory toys containing one or more chemicals and/or chemical compounds, whether or not equipped for chemical testing. This definition also applies to chemistry set in the fields of mineralogy, biology, physics, microscopy, environmental science, etc., as long as they contain one or more chemicals and chemical compounds.

Chemicals and preparations	Maximum limit per set of toys	Risk categories	CAS No. ^a
Ferric sulfate ^g	10g	harmful	7720-78-7
Lactose	100g	-	63-42-3
Lead-free solder ^b	100g	-	-
Magnesium rod ^g	3g	inflammable solid ^h , in the wet flammable ^h	7439-95-4
Magnesium sulfate	25g	-	7487-88-9
Manganese dioxide (IV)	5g	harmful	1313-13-9
Manganese sulfate (II)	15g	harmful	7785-87-7
Ninhydrin ^g	1g	harmful	485-47-2
Pepsase A	10g	harmful	9001-75-6
Potassium bromide ^g	15g	pungency	3/2/58
Potassium ferricyanide ^b	10g	-	13746-66-2
Potassium ferrocyanide ^b	10g	-	13943-58-3
Potassium iodide	10g	-	7681-11-0
Potassium permanganate ^d	15g	harmful, oxidative ^h	7722-64-7
Potassium permanganate: Sodium sulfate mixture (1:2, mass fraction)	10g	harmful, oxidative ^h	-
Silver nitrate ^g [1% (mass concentration) aqueous solution]	10ml	harmful	7761-88-8
Sodium acetate	20g	-	127-09-3
Sodium carbonate	50g	pungency	497-19-8
Sodium chloride	100g	-	7647-14-5
Sodium bicarbonate	50g	-	144-55-8
Sodium hydrogen sulfate	30g	pungency	7681-38-1
Sodium silicate solution ^g (SiO ₂ :Na ₂ O > 2)	100ml	corrosive ^h	-
Sodium sulfate	100g	-	7757-82-6
Sodium thiosulfate	50g	-	7772-98-7
Sulphur ^g	15g	inflammable solid ^h	7704-34-9
Tannin ^b	15g	-	1401-55-4
Tartaric acid ^g	20g	pungency	87-69-4
Stannous chloride ^g	15g	corrosive ^h	7772-99-8

Chemicals and preparations	Maximum limit per set of toys	Risk categories	CAS No. ^a
Iodine tincture ^b [2.5% (mass concentration) ethanol solution] ^e	10ml	harmful, flammable liquid ^h	-
Carbamide	10g	-	57-13-6
Zinc powder and Zinc granule	20g	flammable in wet ^b	7440-66-6
Zinc sulfate (heptahydrate)	20g	harmful	7446-20-0

^a The chemical abstracts service (CAS) registration number is for information only.

^b Substances other than those labelled are named according to the International Union of Pure and Applied Chemistry (IUPAC) rules.

^c Only one of these substances can be used in each set of toys.

^d Toys for children over 12 years of age only.

^e Denatured alcohol (ethyl alcohol)

^f Harmful to iodine, not to its ethanol solution.

^g The classification of substances shall be consistent with the strictest self-classification based on the manufacturer's data.

^h Hazard marks refer to GB 13690.

ⁱ The following risk warnings and safety tips should be given:
 Clove oil - Risk warning: may cause skin irritation;
 Safety tip: avoid contact with skin.

Table 17: Limit for indicator and category of hazard

Name of indicator	Maximum quantity used in each set of toy	Category of hazard	CAS No. ^a
Eosin (tetrabromofluorescein) ^{b,d}	1 g	Irritating	17371-87-1
Aqueous solution of iodine [2.5% (mass fraction)] and potassium iodide [2.5% (mass fraction)]	10 mL	Harmful ^c	7553-56-2
Litmus blue ^b	1 g	-	-
Litmus red ^b	1 g	-	1393-92-6

Name of indicator	Maximum quantity used in each set of toy	Category of hazard	CAS No. ^a
Mixture of luminol and sodium sulfate (5:95, mass fraction)	3 g	Harmful	521-31-3
Mixture of methyl orange ^{b,d} and sodium sulfate (20:80, mass fraction)	1 g	Toxic ^e	547-58-0
Methylene blue ^{b,d}	1 g	Harmful	67-73-4
Phenolsulfonphthalein ^d	1 g	Irritating	143-74-8
Thymol blue	1 g	-	76-61-9
General dispersion test paper ^b	1 pack	-	-

^a CAS number is only for information use.

^b Apart from indicated substances, other substances are named by IUPAC rules.

^c "Harmful" applies to iodine but not to its solution in ethanol.

^d Categorization of substance should be strictly harmonized according to producer's information.

^e Hazard label refers to GB 13690.

Denatured methylated spirit and reagents listed in Table 18 can be used as required in accordance with the instructions of toys. However, they should not be supplied in the toy products.

Table 18: Maximum concentration and hazard category of reagents that shall not be provided, but are allowed to use in chemistry experiment toys

Name of reagent	Maximum concentration (mol/L)	Hazard category	CAS No. ^a
Ammonia	2	Irritating	1336-21-6
Hydrochloric acid	2	Irritating	7647-01-0
Hydrogen peroxide ^b	1	-	7722-84-0
Sodium hydroxide solution	1	Corrosive	1310-73-2

^a CAS number is only for information use.

^b Solution of 3% (volume fraction) hydrogen peroxide.

^c Hazard label refers to GB 13690.

3 CONCLUSION

China gives great importance to implement a series of regulations and standards in order to regulate the production and management of toys, for the safety of environment in country.

However, there are still some gaps between China and the European Union in terms of the relevant regulations and standards on chemicals uses in toys. The European Union has most comprehensive and strict standards in terms of the management of chemicals in toys, which are referred by many countries. Although some limits in China's standards are consistent with similar to the European Union, however limits for certain chemicals are more relaxed in China.

There are still cases of toy recall in China due to excessive chemical contents. The authorities in charge need to take more actions in order to improve the enforcement of relevant regulations and standards, as well as strengthen the quality supervision of toys management, to meet the chemical requirements in toys in China.