

Solutions for Children's Product Testing

For the safety of our children

Introduction

Agilent provides the tools you need to detect and measure harmful contaminants in children's products. Toys, jewelry, clothing, and other child products are frequently recalled due to the presence of unsafe levels of substances such as lead and phthalates. The U.S. Consumer Product Safety Commission (CPSC), the European Union (EU), and regulatory agencies in other countries are continually redefining acceptable levels of harmful substances in children's products to ensure child safety.

If you are a manufacturer, importer, reseller or testing laboratory of children's products, you can feel confident that Agilent will provide you with everything you need to ensure your products comply with product safety regulations— now and into the future.



Key Benefits

- **Future-proof systems.** With the most advanced and sensitive instruments available, easily meet today's regulation requirements, and rest assured you will be prepared for future tightening of regulations.
- **Superior productivity in metal analysis.** The Agilent 700 Series ICP-OES with its simultaneous, multi-element analysis, is the fastest available ICP-OES. Quickly determine heavy metals, so you can move on to other tasks — or run more samples.
- **Outstanding specificity for phthalate determination.** Determine difficult to differentiate phthalates, and reduce matrix interference with chemical ionization (CI) on the Agilent 220-MS Ion Trap Mass Spectrometer. Get the right answer the first time.
- **Simplified sample preparation for fast screening of phthalates.** Quickly screen raw materials for the presence of phthalates with the Agilent Chromatoprobe. Thermal desorption negates the need for copious amount of solvent and labor, saving you time and money.
- **First-class support.** Our team is dedicated to getting your laboratory quickly up and running, and keeping productivity at its peak. Take advantage of our comprehensive training and ongoing technical support.

Worldwide Regulatory Requirements

Regulatory requirements are progressively becoming more stringent worldwide. Agilent's solutions will ensure that you remain compliant today and into the future.

European Regulations

Safety of toys and children's products has been regulated within the European Community under EN 71 for a number of years:

- 1998: EN 71 Part 3 defines requirements for testing the migration of inorganic elements (Table 1).
- 2006: EN 71 Parts 9, 10, and 11, defines requirements for testing organic chemical compounds.

These standards have also been adopted in many countries outside the European Community.

Table 1. Maximum acceptable element migration from toys in mg/kg of toy material under EN 71 Part 3.

Toy Materials	Elements							
	Sb	As	Ba	Cd	Cr	Pb	Hg	Se
Modelling clay & finger paints	60	25	250	50	25	90	25	500
Any other toys	60	25	1000	75	60	90	60	500

U.S. Regulations

In August 2008, the U.S. Congress enacted the Consumer Product Safety Improvement Act (CPSIA 2008), which defines new limits for lead and phthalates content that must be met by manufacturers and importers of products for children aged 12 and under. The U.S. Consumer Product Safety Commission (CPSC) is now in charge of implementing the CPSIA.

Initial implementation of CPSIA included mandatory third party testing for lead and phthalates:

- 10 February 2009: Lead limit set to 600 ppm and six phthalates limit set to 0.1% (Table 2).
- 14 August 2009: Lead limit to be lowered to 300 ppm and 90 ppm in surface coatings.
- 10 February 2010: Mandatory testing of the final product by a certified third party laboratory.

Table 2. Maximum limits of 6 regulated phthalates in the U.S.

Phthalate	Restriction for	Max. Limit
Diethylhexyl (DEHP)	Toys and childcare articles made of plastic materials	0.1%
Dibutyl (DBP)		0.1%
Benzylbutyl (BBP)		0.1%
Diisononyl (DINP)	Toys and childcare articles made of plastic materials that can be placed in the mouth by children	0.1%
Diisodecyl (DIDP)		0.1%
Di-n-octyl (DNOP)		0.1%

Other Countries

Other countries are also implementing standards for children's products:

- September 2007: Brazil issued a Ministerial Act (Compulsory Testing and Licensing Requirements for Imports of Toys, Circular No. 520/2007) restricting hazardous materials in toys (Table 3).
- 22 January 2009: Australia published the "Trade Practices Act 1974 — Consumer Product Safety Standard for Lead and Certain Elements in Children's Toys", coming into force on 1 January 2010. It requires children's toys to comply with the Australia/New Zealand Standard AS/NZS ISO 8124.3:2003, which limits migration of lead (Pb), mercury (Hg), selenium (Se), antimony (Sb), arsenic (As), barium (Ba), cadmium (Cd) and chromium (Cr) to limits equivalent to EN 71 Part 3 (Table 1).
- 11 March 2009: Argentina followed Brazil with implementation of the same limits for the six regulated phthalates (Table 3).

Table 3. Maximum limits of 6 regulated phthalates in Argentina and Brazil.

Phthalate	Argentina		Brazil	
	Restriction for	Max. Limit	Restriction for	Max. Limit
DEHP	Toys and childcare articles made of plastic materials	0.1%	Plastic material in all kind of toys made from vinyl plastics	0.1%
DBP		0.1%		0.1%
BBP		0.1%		0.1%
DINP	Toys and childcare articles made of plastic materials that can be placed in the mouth by children	0.1%	Plastic material in all kind of toys made from vinyl plastics for children under 3 years of age	0.1%
DIDP		0.1%		0.1%
DNOP		0.1%		0.1%
Effective date	11 March 2009		March 2008	

A total of 14 countries, including Japan and Mexico, have implemented restrictions for phthalates in children's toys.

Agilent offers a complete range of solutions for meeting and exceeding the requirements of all of these regulations worldwide. The following section shows how Agilent solutions for children's product testing offer superior productivity and testing reliability.

Superior Productivity for Metals Determination

Several elemental spectroscopy techniques can be used for analysis of heavy metals in children's products. While U.S. CPSIA 2008 specifically focuses on a single element, lead, the EN 71 Part 3 and AS/NZS ISO 8124.3 standards list 8 elements to be controlled.

Within the Agilent atomic spectroscopy solutions portfolio, an array of choices are available to help laboratories determine the best technique. A simple selection based on limits of detection, sample throughput and number of elements to be determined is shown (Figure 1).

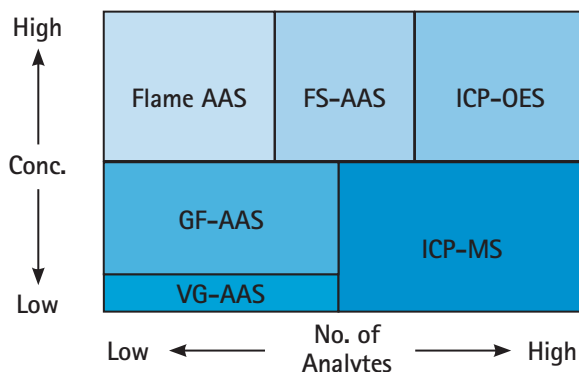


Figure 1. Recommended atomic spectroscopy techniques versus throughput and element determination requirements.

The Agilent 700 Series ICP-OES series (Figure 2) represents the best choice for laboratories that typically analyze large numbers of samples and are looking for maximum productivity, low ppb detection limits, and flexibility in system configuration.



Figure 2. Quickly and easily measure migration of controlled elements from toy materials in a single determination using the 700 Series.

A selection of accessories are available to further enhance productivity, such as the SVS 1 Four Port Switching Valve system for the 720/730 ICP-OES. The SVS 1, immediately rinses the sample introduction components while the next sample is introduced, reducing carry-over, increasing throughput (by up to 33%), and reducing cost per analysis.

Fast and Specific Phthalate Determination

Differentiate Phthalates Using Chemical Ionization with the Agilent 220-MS.

Full scan EI total ion chromatograms from real toy samples typically show severe polymer matrix interference (Figure 3).

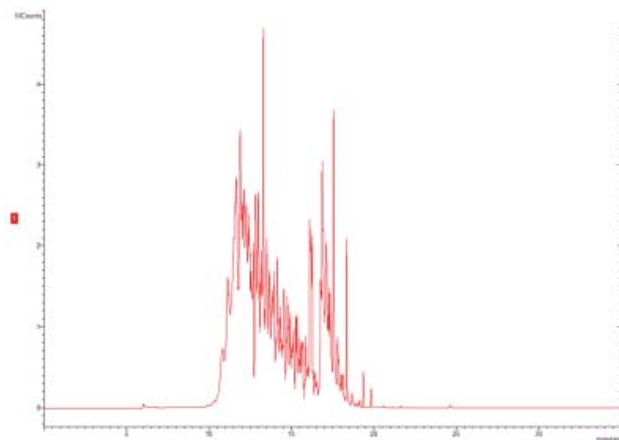


Figure 3. Full Scan EI chromatogram from a plastic ball.

Consequently, extracted ion chromatograms are very hard to interpret. With these conditions, it is very difficult to accurately determine all phthalates using retention time identification alone, and the likelihood of a false positive is high (Figure 4).

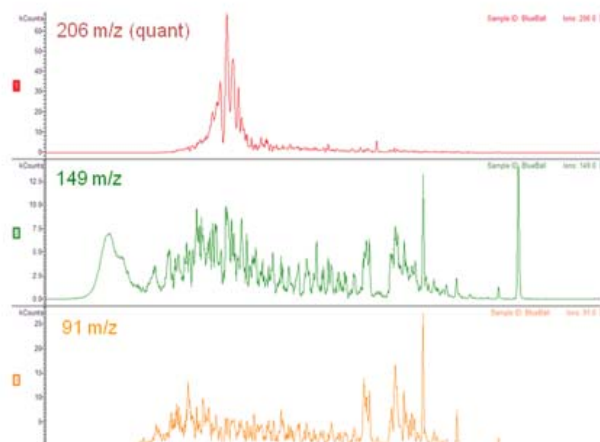


Figure 4. Extracted ions at 206 m/z (quant), 149 m/z and 91 m/z for BBP in a plastic ball matrix.

Low pressure CI in the Agilent 220-MS GC/MS system gives a strong molecular ion for phthalates of interest. It results in much cleaner TIC and extracted ion chromatograms, making data review extremely simple (Figure 5).

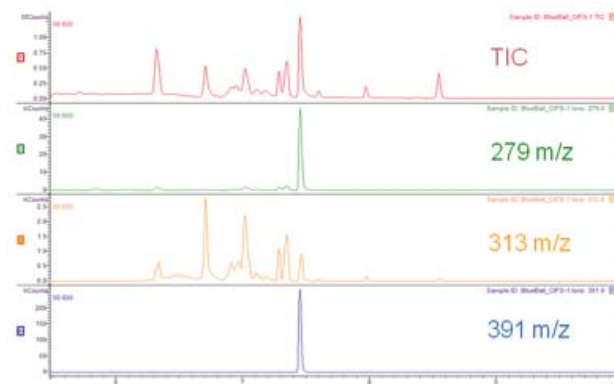


Figure 5. CI GC/MS full scan screen for phthalates in a blue plastic ball.

Phthalates mass spectra are nearly identical at longer chain lengths. With 25-50% abundant Ion Trap CI Molecular ions, a CI-MS full scan will allow identification of most phthalates. Unknown phthalates can be quickly screened and identified, complementary to the CPSC EI method.

The CI method can run automatically after a conventional EI method without any hardware changes or intervention from the user, making data review faster, and greatly reducing the risk of false positives.

Sample Preparation: Save Time and Solvent with Chromatoprobe

Conventional sample preparation as listed in the CPSC CH-C1001-09 involves a triplicate solvent extraction, which is very labor intensive with heavy solvent use.

The Agilent Chromatoprobe sample introduction device removes the need for solvent extraction by using thermal desorption instead. Labor and cost per analysis are drastically reduced.

Screening runs are obtained with no costly sample preparation and run times of 10 minutes or less are possible.

This solution is ideal for quick and cost-efficient screening of raw materials for the presence of phthalates. The CPSC method can then be applied for routine control of the final products.

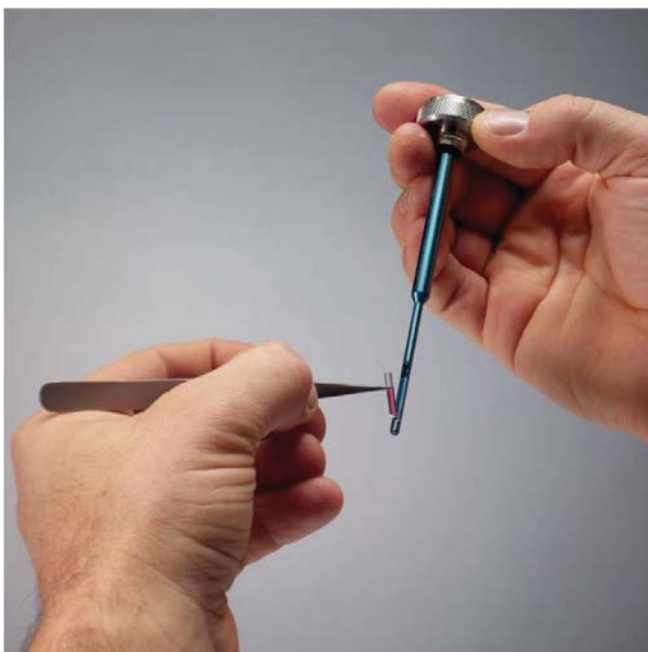


Figure 6. The Agilent Chromatoprobe sample introduction device removes the need for solvent extraction.

Other Agilent Solutions

Besides phthalates and metals, numerous other chemicals are regulated in consumer products in general, and toys in particular.

Agilent provides a comprehensive range of additional solutions to determine metals and organic chemical compounds in toys and other consumer products:

- Cary 50 UV-Vis for Cr^{+VI} in RoHS related products.
- 700 Series ICP-OES for the determination of heavy metals in plastics to assess compliance with RoHS and WEEE directives.
- GC/MS 200-MS instruments for the determination of formaldehyde, polybrominated biphenyls (PBB), polybrominated diphenyl esters (PBDE), plasticizers, monomers, coloring agents, primary aromatic amines and more.
- 320-MS LC/MS systems for the determination of the widest range of organic compounds.

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