# Guideline Regarding Non-Containment Management on Fujitsu Group Specified Chemical Substances

May 1, 2007 (Edition 2.0)

Fujitsu Limited

1. Objectives of This Guideline

It is expected that regulations regarding chemical substances contained in products, such as RoHS Directive in EU, Japanese “J-Moss”, and “China RoHS”, will be becoming stricter worldwide.

In response to this, Fujitsu Group revised “Fujitsu Group Green Procurement Direction” in May 2007 and has requested its suppliers to conform to its requirements specified in the direction regarding chemical substances contained in products to Fujitsu Group, or used in manufacturing processes of the products. In the revised direction, Fujitsu Group has specified chemical substances in five categories: “Banned Substances”, “Control Substances”, “Banned Substances for packaging Materials”, “Prohibited Substances in Manufacturing Process”, and “Other Restricted Substances in Delivery Destination Countries or Areas”.

As it is necessary to observe legal regulations, especially, non-containment of Banned Substances in products to Fujitsu Group shall be severely managed. In this regard, this guideline provides suppliers with basic ideas and methods how to verify and manage containment of the Banned Substances.

Please note that judgment whether or not products to Fujitsu Group comply with “Fujitsu Group Green Procurement Direction” shall be subject to the direction it self.

2. Scope

This guideline applies to all deliverables (hereinafter “Deliverables”) such as materials, components, units, accessories, software packages and packaging materials that are equipped to Fujitsu Group’s products, or OEM products.

3. Definition of Terms

3.1 Containment:

A chemical substance exists in Deliverables.

3.2 Impurities:

substances that are contained in natural materials and cannot be eliminated during processes in which they are manufactured into industrial sources

3.3 Material:

homogeneous material which cannot be decomposed further more or composite materials which can be regarded as homogeneous in order to fulfill its specific function(s), for which it is set or formed at particular position

3.4 Concentration:

content rate of chemical substances; the denominator on calculating concentration is mass of Material and the numerator is mass of the applicable chemical substance. In the case of metal alloy, a metal element in the metal alloy will be the numerator.

3.5 Intentional addition:
deliberate use in the formulation of Deliverables where its presence is desired to provide a specific characteristic, appearance or quality regardless of concentration of the chemical substance

4. Non-Containment Management Principles for Specified Chemical Substances
The basic concepts of management that Deliverables do not contain Banned Substances (which are defined in “Fujitsu Group Green Procurement Direction”) are as follows:

| | |
|---|---|
| Source management: | Every effort shall be made to eliminate Banned Substances via strict management at Material level. |
| Traceability: | Only identified Materials shall be used. |
| Management responsibility: | Suppliers who sell or supply Deliverables shall be responsible for verifying, by appropriate means, whether or not their supplying information about the contained chemical substances is correct. |

5. Management Level
Concentration of Banned Substances shall be managed per Material of which Deliverables consist. Accordingly, in case that Fujitsu Group Green Procurement Direction specifies certain permissible concentrations in “Standards of ban”, concentration of Banned Substances “per Material” in Deliverables must be below the concentrations specified in “Standards of ban”. In this case, “per Material” means the minimum unit which is unable to be decomposed further. Examples of such minimum unit are as follows. (Refer to Figure 1.)

5.1 Examples of materials that should be managed as different Materials
- Base metal that is a structure member or sheet metal material vs. plating films, chromate coats, and paint coats
- Formed plastics vs. surface-printed inks or paint coats
- Metal used on printed wiring boards or LSI wirings vs. insulator resin or glass

5.2 Examples of materials that should be managed as one Material
- Alloys composed of two or more metal elements
- Plastics that is a mixture of polymer and inorganic particles or low-molecular compounds
- Glass fiber reinforced epoxy resin used as the core material for printed wiring boards
- Conductive adhesives that are composite materials including metal powder and polymer
- Inks and paints that are composite materials including colorants, shields, and polymer vehicles

6. Management Phases for Banned Substances

Since it is unrealistic to verify all Materials of all Deliverables, Materials that are produced from the same raw materials through the same manufacturing processes are regarded as equivalent each other. On the assumption that Banned Substances are not attached, mixed, or produced during manufacturing processes, the management at Material level shall be normally conducted as below. If management at Material level is difficult, it is permitted to manage the containment of Banned Substances based on the result of material-element analysis for manufactured items using analytical techniques with adequate sensitivity at statistically sufficient frequency.

6.1 If a “starting material” is processed to the Material which forms a part of the Deliverables or the Deliverables itself along with no composition change during manufacturing processes, such starting material shall be managed to control containment of the chemical substances.

- Resin pellets prior to injection molding
- Metal plates, blocks, etc. prior to pressing/cutting

6.2 If a “starting material” is processed to the Material which forms a part of the Deliverables or the Deliverables itself along with composition change during manufacturing processes, such starting material shall be managed with taking into account the composition changes to control containment of the chemical substances.

- Printings, paintings, and adhesive joints
  If ink, paints, or adhesives used on these parts contains an organic solvent, water, or other volatile component, they shall be managed based on its dry mass resulting from the elimination of the volatile constituents.
- Electrodeposition coating
  Coat liquid shall be managed based on the quantity of the electrodeposited element contained in the coat.
- Plating
  Plating liquid shall be managed to ensure that the concentrations of lead, cadmium, and mercury contained in it are sufficiently low. "Sufficiently low" here means that the concentrations of lead, cadmium, and mercury contained in the plated Materials are guaranteed to be lower than those specified in Section 7 "Concentrations That Suggest Intentional Addition".
- Vapor-deposited films and sputtered films
  “The target” of vapor-deposition or sputtering shall be managed with taking into account the evaporation of each substance or the sputtering efficiency.

6.3 Chromate coat that may be subjected to chromium oxidation-reduction reactions

- Hexavalent chromium contained in a chromate coat of Deliverables shall be managed based on conducting chemical analysis of test pieces having chromate coats that are prepared under the same or equivalent conditions (substrate, treatment liquid, and treatment processes) as those of the Deliverables. In this case, the shapes of the test

pieces don’t matter, even if they are different from those of the Deliverables.

7. Concentrations That Suggest Intentional Addition

In the Fujitsu Group Green Procurement Direction, it is specified that a part of Banned Substances is allowed to be contained in Deliverables in case that either containment of the substances are applicable to the “Exempted applications”, or the substances are contained as impurities whose concentration don’t exceed certain permissible values given in the Direction.
Considering JIS (Japanese Industrial Standards) regulations, other authorized standards, and the generally accepted materials and manufacturing methods, it is assumed that concentrations of the substances as impurities contained in materials that are distributed at present are sufficiently lower than those indicated in Table 1. Therefore, other than being applicable to the “Exempted applications”, if the concentration of a substance exceeds the values indicated in Table 1, it is likely that the substance was intentionally added, otherwise attached, mixed, or produced during a certain phase of the supply chain. In this case, it is necessary to identify the cause of such containment and defuse it unless it results from impurities.

Please note that the concentrations given in Table 1 are not the standards of ban for Materials, but rough indications for suppliers to have general ideas whether the substances are intentionally added, otherwise attached, mixed, or produced in the supply chain.

Table 1 Concentrations that suggest intentional addition, or attachment, etc. in supply chain (unit: ppm)

| Material | | Lead | Cadmium | Mercury | Hexavalent chromium |
|---|---|---|---|---|---|
| Base metal | Iron alloy | 200 | 75 | 100 | |
| | Aluminum alloy | 100 | | | |
| | Copper alloy | 500 | | | |
| | Other metal | 200 | | | |
| Metal plating film (including lead-free solder plating) | | 200 | 75 | 100 | |
| Chromate coat | | - | - | - | See Chapter 8. |
| Solder for mounting | | 1000 | 75 | 100 | |
| Resin and plastics | | 100 | 50 | 100 | 200 |
| Paint and ink | | 100 | 50 | 100 | 200 |
| Glass and ceramics | | 500 | 75 | 100 | 200 |

No particular concentration analysis method is specified. Any method is acceptable if it is verified to have both the lower detection limit lower than the concentrations shown in Table 1 and the enough accuracy for this quantitative analysis.

For your information, the following instructions are for the two analysis methods which are widely used. These analysis methods are useful, but not universal. If it is difficult to use these methods on a certain Material, select a more appropriate analysis method.

For details about analysis, please also refer to “Guideline regarding analysis on Fujitsu Group specified chemical substances” (http://www.fujitsu.com/global/about/procurement/green/).

7.1 Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) (Conforming to JIS K0116)

- Use apparatuses and procedures which have been confirmed their detection limits, quantitative determination limits and linearity of the calibration curve with blank solution and calibration solution.
- When adjusting the specimen solution, it is necessary to dissolve the specimen completely. Undissolved residues, if remain, must be dissolved separately so that all elements are dissolved before measurement.
- Measure after elimination of interference or with expectation of error from interference, such as selecting bright line which are not affected by coexisting elements.
- Since pretreatment and other detailed analysis conditions depend on materials, determine analysis conditions and confirm the accuracy level for each material, and then take measurement.

7.2 X-ray Fluorescence Spectrometry (Conforming to JIS K0119)

- On the calibration curve method, use a calibration curve that is acquired using “standard specimens for calibration” of which both concentrations of the substances in Table 1 are known and compositions are similar to the material to be analyzed. It is necessary to confirm the lower detection limit, the quantitative determination limit, and the accuracy level in quantification in the vicinity of the concentration indicated in Table 1.
- On the fundamental parameter method as well, prepare “standard specimens for calibration” of which both concentrations of the substances in Table 1 are known and compositions are similar to the material to be analyzed, and conduct calibration with referring to the specimens. It is necessary to confirm the lower detection limit, the quantitative determination limit, and the accuracy level in quantification in the vicinity of the concentration indicated in Table 1.
- Not to mention caring fluctuations or noise peculiar to the apparatuses, it is necessary to confirm the effects of coexisting elements per Material with a specimen containing the target substance at a known concentration. Then conduct appropriate treatment such as selecting or compensating a bright line for quantitative determination.

8. Judging Whether a Chromate Coat Contains Hexavalent Chromium

No useful analysis technology has been established to determine the concentration of hexavalent chromium in chromate coats. Therefore, conduct the following dissolution test on the specimen and judge whether hexavalent chromium is contained in the chromate coat that is

formed from the combination of the base material, treatment liquid, and process conditions. If the result of the dissolution test indicates that the quantity of hexavalent chromium is equal to or less than the following quantitative determination limit, the chromate coat formed based on the above combination is judged not to contain hexavalent chromium.

[Dissolution test method for hexavalent chromium in chromate coats]
This method, which is explained below, conforms to JIS H8625 Annex 2 "4.1 Determination of chromium (VI) - Spectrometric method using 1,5-diphenylcarbazide".

Immerse a chromate-coated specimen with a surface area of 50 $cm^2$ in 50 ml of (A) pure water, conduct boiling extraction for 5 minutes, remove the specimen, and add (B) dilute sulfuric acid to the extract to acidify it. Then add (C) diphenyl carbazide solution and (D) buffer solution to the extract, and dilute it with pure water to make total liquid quantity 250 ml. As for this solution, measure the absorbance corresponding to 540 nm of light using an absorptiometer, and calculate the hexavalent chromium dissolution quantity per unit area from a beforehand obtained calibration curve. The apparatus and conditions for the absorptiometry conducted here must be such that a hexavalent chromium concentration of 2 ppb can be detected. A hexavalent chromium concentration of 2 ppb is equivalent to a dissolution quantity of 0.01 $\mu g/cm^2$.

Reference:

| Surface area of specimen | (A) Pure water | (B) Dilute sulfuric acid | (C) Diphenyl carbazide solution | (D) Buffer solution | (E) Total liquid quantity (*) |
|---|---|---|---|---|---|
| $50cm^2$ | 50ml | 3ml | 3ml | 25ml | 250ml |

* Dilute with pure water to make total liquid quantity 250 ml including the collected rinse water.

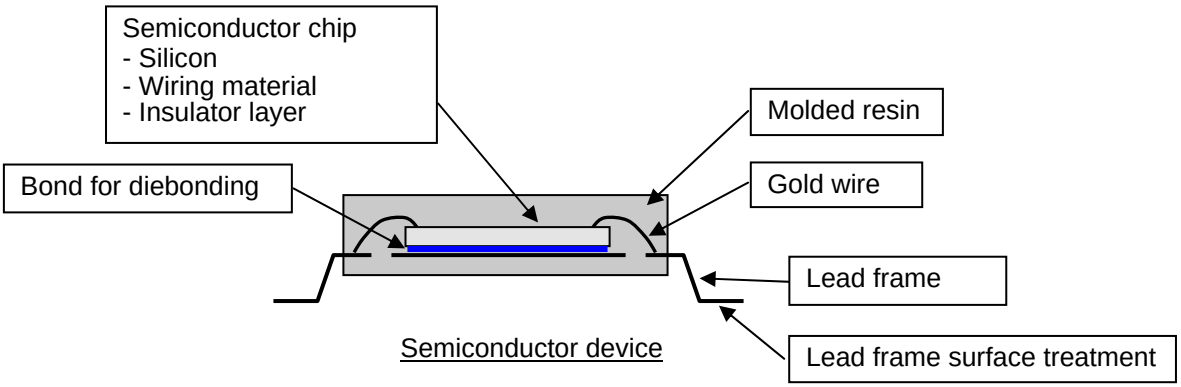
Judgment:
The detection limit of the above method is 0.01 $\mu g/cm^2$, which is less than the stable quantitative determination limit. Therefore hexavalent chromium is judged as not contained if its dissolution concentration is 0.1 $\mu g/cm^2$ or lower.
If a new analysis method that is better in technology and cost is developed, the method specified above may be switched to the new one.

9. Revision history

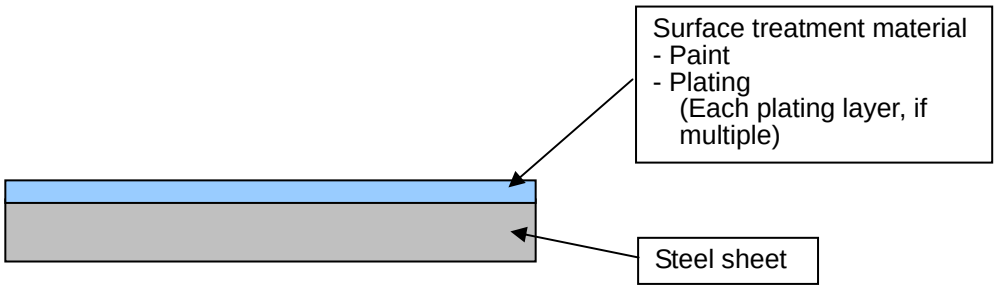
November 1, 2004 (Edition 1) : Created
May 1, 2007 (Edition 2) : Revised in part

Figure 1 Examples of materials that should be managed as different Materials

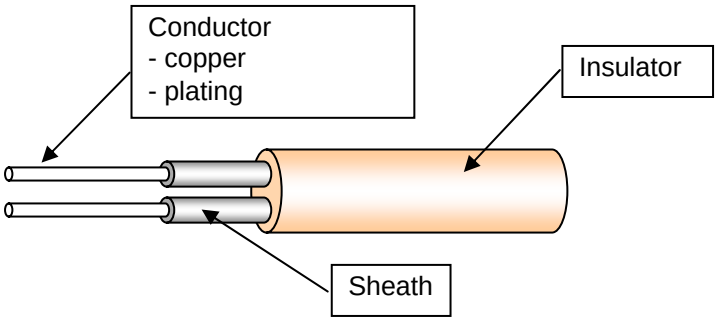
(Each text box, each item in a text box as well, are regarded as different Materials.)




Semiconductor device




Painting or plating




Cable