

Adaption to scientific and technical progress under Directive 2002/95/EC

Results previous evaluation
Exemption No. 22

“Lead as impurity in RIG (rare earth iron
garnet) Faraday rotators used for fibre
optic communications systems”

(Excerpt from Öko-Institut Report 2006;
Annex 1 Monthly Report 3 and Final
Report)

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5.13 Lead oxide in lead glass, bonding materials of magnetic heads and magnetic heads – JEITA (request No. 8)

This request has been withdrawn by the applicant. The justification given is: JEITA had handed in a comment on this issue during first stakeholder consultation but somehow claims not to have commented the requests of the second stakeholder consultation. This is the reason given for not supplying any additional information possible substitutes to the consultants. JEITA has consequently withdrawn its request for exemption.

5.14 Cadmium as doping material in avalanche photodiodes (APDs) for the optical fibre communication systems – JBCE/JEITA (request No. 9)

This request has been withdrawn by the applicant. The justification given is: due to the published maximum concentration values for cadmium, both JBCE and JEITA have decided to withdraw their requests since the quantity of cadmium contained in APDs is clearly lower than the level defined in the maximum concentration values.

5.15 Lead in optical isolators – JEITA/Sumitomo (request No. 10)

5.15.1 Requested exemption

JEITA (Japan Electronics & Information Technology Industries Association) on behalf of NEC Corporation and Murata Manufacturing Co., Ltd and SUMITOMO METAL MINING CO.,LTD. request an exemption for lead in optical isolators.

The function of optical isolators consists in the reduction of reflection noise in several optic communication systems (transceiver, transmitter and receiver, optical amplifier). For this purpose rare earth iron garnet (RIG) are used because of their magneto-optical effect.

The garnet crystal is grown by the so called LPE (liquid phase epitaxial) method which uses lead oxide as flux material. In doing so lead is slightly included in a crystal as an impurity.

The total annual quantity of RIG used for optical isolators in the EU is specified to be 6.000 g. Starting from a typical Pb content of 0,3 to 1,0 % the total amount of Pb in this applications accounts for less than 100 g per year. According to the applicant in a dissolution test using Dutch serial batch test Pb has not been detected.

5.15.2 Summary of justification for exemption

The applicants justify their request for exemption with technical reasons:

- There are several solution growth techniques for RIG available but only LPE technique leads to RIG with all the specification required for optical isolator.

- The specifications for RIG will not be achieved using alternative lead-free flux materials.

Furthermore the applicants discuss the application of VCSEL (Vertical Cavity Surface Emitting Laser) for fibre optic communication system because this system can be used without optical isolator. However, the transmission distances are restricted at 1.300 nm to 20 km (compared to transmission distances of more than 40 km using DFB laser with optical isolator).

5.15.3 Final recommendation

This exemption request should be granted according to Article 5 (1) b, as no alternative production techniques are existent providing the needed quality of RIG used as optical isolators and substitution on a system level (VCSEL instead of DFB laser) is restricted to short distance transmission. Furthermore RIG as optical isolator is used only for signal transmission in professional applications; the annual amount of Pb compared to other applications is nearly negligible.

We suggest the following wording:

Pb as impurity in RIG Faraday rotators used for fibre optic communication systems.

5.16 Lead in sheath heater of Microwaves – JBCE (request No. 11)

This request has been withdrawn by the applicant. The justification given is: it is foreseeable that alternative technologies will be available in the near future. No detail is given though on the nature of these substitutes. The issue is raised on the open question regarding sufficient supply of the substitutes.

6 Further proceeding

The focus for the forthcoming work will lie on the closure of final recommendations of requests from set 1. At the same time, requests from set 2 will undergo a first completeness check, followed by a contact to the applicant and/or other parties in order to clarify open questions.

Annex 1: Revised checklist requests set 1

(See file ChecklistReport3.pdf)

Annex 2: Overview documents set 2

(See file Document management.pdf)

be a substitution problem for CrVI in devices belonging to category 3 WEEE Directive. The problems - according to the applicant's information – did only relate to the combination of corrosion protection and EIS.

6.4 Corrigendum “Lead in optical isolators – JEITA/Sumitomo (set 1 request No. 10)”

(Updating section 5.15 of monthly report 3 and update of 21 June 2006)

6.4.1 Requested exemption

JEITA (Japan Electronics & Information Technology Industries Association) on behalf of NEC Corporation and Murata Manufacturing Co., Ltd and SUMITOMO METAL MINING CO.,LTD. request an exemption for lead in optical isolators.

The function of optical isolators consists in the reduction of reflection noise in several optic communication systems (transceiver, transmitter and receiver, optical amplifier). For this purpose rare earth iron garnet (RIG) are used because of their magneto-optical effect.

The garnet crystal is grown by the so called LPE (liquid phase epitaxial) method which uses lead oxide as flux material. In doing so lead is slightly included in the crystal as an impurity.

The total annual quantity of RIG used for optical isolators in the EU is specified to be 6.000 g. Starting from a typical Pb content of 0,3 to 1,0 % the total amount of Pb in this applications accounts for less then 100 g per year. According to the applicant in a dissolution test using Dutch serial batch test Pb has not been detected. It is thus not expected that there are traceable impacts on the environment when entering the waste stream.

6.4.2 Summary of justification for exemption

The applicants justify their request for exemption with technical reasons:

- There are several solution growth techniques for RIG available but only LPE technique leads to RIG with all the specification required for optical isolator.
- The specifications for RIG will not be achieved using alternative lead-free flux materials.

Furthermore the applicants discuss the application of VCSEL (Vertical Cavity Surface Emitting Laser) for fibre optic communication system because this system can be used without optical isolator. However, the transmission distances are restricted at 1.300 nm to 20 km (compared to transmission distances of more than 40 km using DFB laser with optical isolator).

Data and information mentioned above was brought forward and presented by JEITA and Sumitomo in September 2005. Taking this level of information into account the Consultants recommended to grant this request for exemption.

In November 2005 the Consultant received first references of garnet Faraday rotators equivalent to those described in the request for exemption. According to the manufacturer of these products (Integrated Photonics, Inc.) all of the bismuth rare-earth iron garnet Faraday rotator products have been third party certified to be compliant to all RoHS requirements and, in particular, all have less than 1.000 wt. ppm of lead. On inquiry Integrated Photonics, Inc. provided further information covering amongst others

- Technical specifications of the products
- Third party certification of compliance to the requirements of the RoHS Directive

As this information differed considerably from data and information given by JEITA/Sumitomo, both parties were asked to give comments on each contributions of the other party.

Integrated Photonics provided detailed information on test methods, product function and properties and market capabilities. Summarising all of the contributions and comments the Consultants conclude that RIG used for optical isolators compliant with the RoHS requirements are now available and thus changed its initial recommendation into the new recommendation not to grant an exemption on 21 June 2006.

Since more controversial information reached the Commission at the beginning of July 2006 the Consultant was asked to re-consider the newly brought forward arguments by all sides of industry (including the original applicant JEITA/ Sumitomo as well as Integrated Photonics and other stakeholders).

After having cross-checked the available documents the following conclusion can be drawn:

- This exemption requests does not represent an application which has a significant environmental impact. The lead content in the RIG Faraday rotator is very low and the probability that it will enter the environment is very low too. Thus, this exemption requests rather relates to the question of the rapidity of technological innovation in a very complex supply chain.
- A standard test procedure in order to determine RoHS compliance of such an application as the use of RIG Faraday rotators in optical isolators does not seem to exist. Hence, RoHS compliance is difficult to prove. Integrated Photonics has delivered third party certification of RoHS compliance. The original applicant has stated to have found lead above the 1.000 ppm Pb threshold in test material from Integrated Photonics (whereas it is not clear how big the sample was and how many items were found not be RoHS compliant according to the applicant's test). Hence in this case no objective evaluation can take place. In view of the further evaluation a decision had to be taken: it was assumed that the RIG Faraday rotators produced by Integrated Photonics are RoHS compliant since they were tested by a third party laboratory including a description of the test procedure. Furthermore Integrated Photonics

declared to have shipped RoHS compliant products for some time already accepted as such by customers.

- Some of the comments received from industry do not refer to what was originally dealt with: the original request refers to lead impurities in RIG Faraday rotators¹. The evaluation according to Article 5 (1) (b) thus has to analyse whether a lead-free alternative is scientifically and technically practicable. Arguments stating that long test procedures are needed until an optical isolator containing a RoHS compliant Faraday rotator can be regarded as reliable for the use in fibre optic communication systems² are not valid since they deal with subsequent problems in the supply chain and not with the Faraday rotator itself for which an exemption was requested.
- Nevertheless, it is indeed so that there might be problems at the end of the supply chain (i.e. manufacturers of optic fibre telecommunication systems) in being RoHS compliant. However, this question is not part of this evaluation and these problems are not related to whether a RoHS compliant RIG Faraday rotator can be put on the market or not. Concerning supply chain problems it would have to be evaluated why the manufacturers of fibre optic communication systems could not use RoHS compliant components on time for 1 July 2006 and why no such components are available from their suppliers³.
- There are arguments brought forward on lacking ability to cover market demand with RoHS compliant RIG Faraday rotators. This argumentation is not covered by the criteria in Article 5 (1) (b). When applying the article in a narrow sense, nothing is mentioned concerning market or supply chain availability⁴. Furthermore, Integrated Photonics has used comprehensive arguments that (at least European) market demand could be satisfied when corresponding purchase orders have been placed. The evaluation thus concluded that there is no valid argument in line with Article 5 (1) (b) justifying the need for an exemption⁵.
- Applying Article 5 (1) (b) the Consultant concluded that no justification is given to grant the requested exemption. Going beyond the criteria mentioned in Article 5 (1) (b) though, more investigation would be needed to evaluate fully whether the use of RoHS

¹ And not to other kinds of Faraday rotators like e.g. YIG Faraday rotators.

² A RIG Faraday rotator is used in optical isolators which undergo certain test procedures in order to be reliably used in passive optical components which are themselves part of fibre optic communications systems.

³ Since in this case there is contradictory information on the availability and reliability of those components.

⁴ A lot of controversial arguments are being used by both Integrated Photonics and other industry stakeholders.

⁵ Nevertheless market availability can also be considered as an argument in line with Article 5 (1) (b) when rather interpreted as technical impracticability. This is a question of interpretation. In this case it was concluded that market availability does not affect technical impracticability.

compliant RIG Faraday rotators is feasible with regard to supply chain problems and to reliability in communication systems.

6.4.3 Final recommendation (update 05/07/06)

Against the background and regarding the criteria given in Article 5 (1) (b) there is no reason to grant this exemption request. Taking into account that the environmental impact of granting or not granting the exemption request is negligible the question behind any decision is more about competitiveness and innovation on the market.

6.5 Add-on to report 7 section 5.3 – “Lead alloys as electrical/mechanical solder for transducers used in high-powered professional and commercial loudspeakers” – Meyer Sound (set 2 request no. 16)

Clarification concerning the wording:

The term "several hours" was introduced to make a distinction between continuously operating loudspeaker systems (concert halls etc.) and e.g. emergency loudspeakers (as for this field of application no exemption was requested and seems not to be justified as the continuous operation - in conjunction with the high Sound Pressure Level (SPL) - is the critical point, which stresses the joints extremely).

However, such emergency loudspeaker cases at these SPL seem to be of a very minor market relevance (no data available for this market segment, but much more likely to be part of fixed installations anyhow). Unfortunately, there is no clear threshold value to define where "several hours" begins (we are not aware of any such investigations to figure out such a threshold value and the applicant with his products is obviously well beyond such threshold values anyway). From our understanding of the technology, 2 hours might be an appropriate duration, but even in this case it has to be noted, that the sound system in almost all cases does not work continuously at 125 dB and above, as there are usually breaks (between individual songs and variations within a piece of music). Therefore, also the term "...operating for at least two hours at acoustic power levels..." still would leave a grey area (CONTINUOUSLY operating above this level? Which in practice most likely never will be the case; or: IN TOTAL (adding up the times above 125 dB) operating above this level? Which would need a standardised test procedure). Deleting the term "several hours" would make the scope of the exemption much clearer, but might lead to a slightly broader scope indeed (but see also the fixed installation argument above). The term SPL (sound pressure level) is a well introduced and defined term and part of product specifications (as well as of product marketing) - therefore, SPL needs no further explanation / definition.