

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

Results previous evaluation
Exemption No. 20

“Lead oxide in glass used for bonding front
and rear substrates of flat fluorescent
lamps used for Liquid Crystal Displays
(LCD)”

(Excerpt from Öko-Institut Report 2006;
Annex 1 Monthly Report 2 and 4 and Final
Report)

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- The conclusion of Life-Cycle Analysis is that most of the environmental impact of fluorescent lamps is generated in the usage phase. Substitution by non-lead containing products would lead to increased Hg and Pb emissions into the environment during electricity generation.
- Environment / Costs:
 - The exemption of Pb in amalgam of Compact Fluorescent enhances the opportunity to replace all incandescent lamps. Pb-containing amalgams enable size reductions up to 20% for GLS-shaped ESL), without negative cost implications. This eliminates one of the main reasons for non-users not to buy ESL's.

Final recommendation

Basically this exemption request should be granted according to Article 5 (1) b, as no substitutes are existent providing the functionality. Even this functionality is crucial in order to downsize CFL-I lamps to the size and shape of GLS bulbs and therefore to enlarge acceptance for Energy Saving Lamps.

Information delivered by the applicant is complete and comprehensible. However the exemption should be restricted for the time period the applicant mentioned to be necessary before alternatives without drawbacks will be released.

Against this background we suggest the following wording:

"Lead with PbBiSn-Hg and PbInSn-Hg in specific compositions as main amalgam and with PbSn-Hg as auxiliary amalgam in very compact Energy Saving Lamps (ESL)."

5.8 Mercury free flat panel lamp

Requested exemption

The European Lamp Companies Federation (ELCF) requests an exemption for mercury free flat panel lamp assembled by using lead containing glass solder. The total annual amount of lead in this application is about 60 kg (total EU market).

Summary of justification for exemption

The applicant justifies the request for exemption considering several criteria:

- Technically: Mercury free flat panels without lead are not available. At present no lead-free glass solders/frits is available which can meet the process requirements. Development of lead free flat panel lamps could possibly be finished within a 2 years time frame, but the outcome of the lead-free frit development is not predictable.
- Environment: The panels are the first generation of mercury free flat panels; in case of breakage or at end of life there is no impact of mercury like on usual flat panels. The

lead used in glass solder and solder is not available for environment, because the system is closed and at end of life flat panels are recycled.

Final recommendation

Basically this exemption request should be granted according to Article 5 (1) b, as both no substitutes are existent providing the functionality and mercury containing flat panels would have an negative impact regarding consumer safety as well as environmental impacts.

Information delivered by the applicant is complete and comprehensible. However the exemption should be restricted for the time period necessary to develop a lead free technology. Furthermore the exemption should be related to the specific production process used for manufacturing mercury free flat panel lamps.

Against this background we suggest the following wording:

"Lead as glass solder typically with 70wt%PbO in mercury free flat panel lamps type PLANON."

5.9 Low melting point alloys containing lead

Requested exemption (applicant: Cookson Electronics):

- Substance: Pb
- Function: lowering melting point of the alloy, increase ductility
- Specific application: jumper lead (electrical connection between the EMI shielding layer an the top and bottom side of FR-1, FR-2 and CEM-1 PCB)
- Precise wording: Request for exemption for jumper leads consisting of low melting point alloys containing < 50 % lead

Summary of justification for exemption

- Criteria for justification: technical/scientific reasons, negative environmental and economic impact of alternative solutions
- Critical review on data and information (given by applicant or other parties)
 - alternative alloys with a similar melting point are available, but
 - in the case of Sn20In3Ag the costs increase as a multiple of 20 times and
 - in the case of SnBi the mechanical properties are insufficient.
 - alternative technologies were discussed, but there are various disadvantages::
 - in the case of the use of a Cu rivet the system is fault-prone in service due to deterioration caused by different thermal coefficients of expansion of Cu and the PCB, vibration and corrosion;
 - in the case of hand soldering of the joint between a Cu lead and the top side of the board (necessary if a higher melting point solder is used and the heat for

5.3.3 Final recommendation

Information delivered by the applicant is complete and comprehensible. Basically this exemption request should be granted according to Article 5 (1) b, as at the moment no substitutes are existent providing the functionality. However the exemption should be restricted for the time period the applicant mentioned to be necessary to decide on the technical feasibility.

Against this background we suggest the following wording:

"Lead oxide in the glass envelope of Black Light Blue (BLB) lamps, exemption until 31/12/2006."

5.4 PbO (lead in seal frit) used for making BLU (Back Light Unit Lamp) for LCD televisions – Samsung (set 2 request No. 9)

5.4.1 Description of requested exemption

Samsung Corning Co. Ltd requests an exemption for the use of lead oxide as seal frit used for producing Black Light Unit (BLU) lamps. These kinds of lamps are used as a light source called Backlight Unit (BLU) for Liquid Crystal Displays (LCD). One newly-designed kind of BLU are the flat fluorescent lamps (FFL) which make it possible to use only one flat fluorescent lamp driven by one driving circuit in the BLU for large-size LCD panels instead of up to 20 lamps and as many driving circuits as light source for one 32" LCD panel.

According to an assumption of the applicant the total amount of lead oxide used for this application accounts for about 10.000 kg p.a.

The requested exemption described here is nearly in full accordance to the request of the European Lamp Companies Federation (ELCF) on "mercury free flat panel lamp assembled by using lead containing glass solder" (set 1 request 16; final recommendation see report 2 section 5.8).

5.4.2 Summary of justification for exemption

The request for exemption is based on technical criteria as well as on environmental/toxicological criteria:

- A number of possible substitutes for PbO as sinter material was evaluated (bismuth glass, zinc borate glass, tin phosphate glass). None of these potential substitutes met the required properties being softening temperature (adjustable between 350 to 600 °C), adhesive strength, thermal expansion coefficient (similar to glass substrate) and chemical stability.
- Possible substitutes require higher calcination temperatures to improve the sintering characteristics leading to additional energy consumption during production.

Furthermore lead oxide-free glasses would require more energy due to the high softening temperature of these glasses.

- From a toxicological point of view all raw and basic materials used for possible substitutes are critical.

5.4.3 Final recommendation

Data and information given by the applicant are complete and comprehensible. Basically this exemption request should be granted according to Article 5 (1) b, as at the moment no substitutes are existent providing the functionality of the seal frit adequately.

Analogous to the above mentioned exemption requested by ELCF and considering running activities in developing lead oxide-free substitutes the exemption at hand should be reviewed again latest in 2010 if not part of the four-yearly review of the RoHS Annex before.

In the second monthly report a wording was recommended for request 16 set 1 which restricted a possible exemption to the application mentioned therein ("*Lead as glass solder typically with 70wt%PbO in mercury free flat panel lamps type PLANON*"). Since now nearly full accordance between request 16 set 1 and request 9 set 2 has been assessed, a common wording encompassing both requests should be used for granting an exemption. **Thus the original wording for request 16 set 1 is herewith withdrawn and should therefore not be used for further decision making!**

Against this background we suggest the following wording for both request 16 set 1 and request 9 set 2:

"Lead oxide in glass used for bonding front and rear glass substrates of flat fluorescent lamps used for Liquid Crystal Displays (LCD)."

5.5 Lead in lead oxide glass plasma display panels and other technology large-sized flat display panels – JBCE/JEITA (set 1 request No. 6); lead in lead oxide glass used in plasma display panel (PDP) – KEA (set 2 request No. 19)

5.5.1 Requested exemption

The Japan Business Council in Europe (JBCE), the Korea Electronics Association, LG Electronics and Samsung SDI request an exemption for lead in lead oxide glass used in plasma display panel (PDP). Furthermore JBCE stated in February 2005 that surface conduction electron emitter display (SED) was meant to refer to "other technology large-

- Due to the short time period left between end of the stakeholder consultation and drafting of the final report, no further investigation could take place concerning this exemption request.
- Questions that could not be fully clarified are:
 - Detailed description of (technical specifications) of the application in which solenoid valves are needed and declaration whether these applications fall under the scope of the RoHS Directive.
 - Function of lead in this application
 - Proposal of new wording and agreement to it.
 - Availability of such valves in RoHS compliant form.
 - Asking applicant for providing evidence on supplier problems and roadmap of R&D efforts.

6.32.3 Final recommendation

With regard to the above mentioned arguments no founded exemption can be given at this point. An additional round of questions to the applicant and stakeholders would be necessary to give a justifiable recommendation. The time span necessary for this exceeds duration of the contract.

Should a decision be taken on the grounds of the available documentation it is recommended not to grant the exemption due to the missing information – there is no founded justification in line with Article 5 (1) (b).

6.33 Mercury free flat panel lamp – Osram (request set 4 No. 15)

6.33.1 Requested exemption

Osram and the European Lamp Companies Federation (ELCF) request an exemption for mercury free flat panel lamps (type PLANON®). The lead containing glass solder is used to assemble the flat-panel glass envelope. The specific function of the glass solder is described by the applicant as follows:

“Since PLANON lamps do not use exhaust tubes, an especially designed pump-fill-process that takes place within a vacuum oven has to be used. This process includes the use of a variety of gas atmospheres and related partial gas pressures. The result is a complex interaction between the dielectric layers, the glass spacers and the glass solder/frit. During the pumping process at a certain temperature, the spacers must provide a sufficiently large gap between the bottom and the top glass of the lamp. When the temperature is increased, the top glass must sink toward the bottom glass in such a manner that ensures a good connection between top and bottom glass and simultaneously a tight connection between top

glass and the individual spacers. During this process, the dielectric layers must not build any foam. The temperature dependence of the viscosity of the three lead-containing glass solders/frits has to be such that it supports - for a given amount and form of spacers and thickness of the used sealing frit - the time, temperature, and pressure requirements of the sealing process. The temperature dependence of the three glass solders/frits needs to support the limitations that the sealing process imposes on the amount and thickness of the used frit materials.”

The flat panel lamps are used as a light source for several products, e.g.

- LCD monitors
- Photo lighting equipment
- Design luminaire
- Equipment for inspection of radiographies

The total annual amount of lead in this application is about 60 kg (total EU market).

The ELCF suggests the wording for the exemption as follows: “Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for Liquid Crystal displays, design or industrial lighting)”.

6.33.2 Summary of justification for exemption

The applicant justifies the request for exemption considering several criteria:

- Technically: Mercury free flat panels without lead are not available. At present no lead-free glass solders/frits is available which can meet the process requirements. Development of lead free flat panel lamps could possibly be finished within a 2 year time frame, but the outcome of the lead-free frit development is not predictable.
- Environment: The panels are the first generation of mercury free flat panels; in case of breakage or at end of life there is no impact of mercury like with usual flat panels. The lead used in glass solder and the solder itself are not available to the environment, because the system is closed and at end of life flat panels are recycled.

On inquiry the applicant could provide further information on advantages of mercury free flat panel lamps in comparison to conventional ones being the size (flat lamp), the absence of mercury and the very long lamp life time.

A critical review of the documents made available by the applicant and of further data and information given by other parties lead to the following observations and conclusions:

- Data and information given by the applicant are complete and comprehensible. Basically this exemption request should be granted as at the moment no substitutes are existent providing the functionality of the seal frit adequately.
- The requested exemption is similar to a former request (set 2 No. 16); due to not fully comprehensible and complete information the consultants at that time recommended to

grant the former exemption request but using a wording restricting the exemption to a specific application (backlight unit for LCD).

- Taking into account information now available the formerly recommended restricted wording is seen as obsolete.

6.33.3 Final recommendation

With regard to the above mentioned arguments it is recommended to grant this request for exemption. According to the proposal of the applicant the following wording is considered as appropriate: “Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting)”.

6.34 Electronic equipment where the reliability, durability and longevity of the equipment is paramount – Pulsar Light of Cambridge (request set 4 No. 16)

6.34.1 Requested exemption

Pulsar Light of Cambridge Ltd. requests the exemption of Tin-Lead 60-40 solder. The applicant does not narrow his request to specific application(s) but states that this solder is used in every application.

The applicant states that 325.000 tons of lead is used annually in the UK by all industries but only 1% i.e. 3.250 tons of this lead is used in the electronic and electrical industries under RoHS, mainly in solder.

Even upon inquiry the applicant was not able to specify his request; the consultants interpret the request with a wording as follows: “Use of tin-lead solder for the production of electronic equipment where the reliability, durability and longevity of the equipment is paramount.”

6.34.2 Summary of justification for exemption

The applicant justifies his request for exemption with technical, health impacts, environmental and economic arguments:

- The replacement with lead-free solder does not work reliably, while existing tin-lead solder work exceedingly well.
- The replacement with lead-free solders would have no advantages and many defects which will damage the reliability of the applicant’s products.
- Reduced reliability, durability and longevity of products would increase the amount of products scrapped and the amount of waste produced.
- Furthermore the applicant argues that there would not be a health issue to solve. Since red and white lead oxides were removed from paint and since lead has been