

Consultation No. 6 “Lead in lead oxide glass plasma display panels”

JBCE(Japan Business Council in Europe)  
11 February 2005

- Do feasible substitutes currently exist in an industrial and/or commercial scale?

**No candidate materials are available at this stage. Future commercialization schedule of candidate materials is opaque at all.**

- Do any restrictions apply to such substitutes?

**Not applicable**

- What are the costs and benefits and advantages and disadvantages of such substitutes?

**Not applicable**

- Please indicate a precise wording for this exemption.

**Lead in lead oxide glass in Plasma Display Panels**

**Check List**

CRITERIA	INFORMATION supporting technical and scientific evidence																														
<p><b>1. Please describe the material /component of the electrical and electronic equipment that contains the hazardous substance.</b></p> <p><b>Please indicate the type and quantity of the hazardous substance used in the homogenous material. Please indicate the quantity of the substance in absolute numbers and in percentage by weight in homogenous material.</b></p> <p><b>Please indicate the functionality of the substance in the material of the equipment.</b></p> <p><b>Please also provide an estimate of the annual quantities of the hazardous substance used in this particular application.</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2"></th> <th colspan="2" style="text-align: center;">Pb Weight (g)</th> <th rowspan="2" style="text-align: center;">Functionality</th> </tr> <tr> <th style="text-align: center;">Company A</th> <th style="text-align: center;">Company B</th> </tr> </thead> <tbody> <tr> <td>Front glass dielectric layer</td> <td style="text-align: center;">121</td> <td style="text-align: center;">32 ~ 89</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">Adjusting the softening temperature</td> </tr> <tr> <td>Rear glass dielectric layer</td> <td style="text-align: center;">24</td> <td style="text-align: center;">10 ~ 32</td> </tr> <tr> <td>Bus electrode and black stripe</td> <td style="text-align: center;">13</td> <td></td> </tr> <tr> <td>Barrier ribs</td> <td></td> <td style="text-align: center;">37 ~ 247</td> </tr> <tr> <td>Sealing</td> <td style="text-align: center;">14</td> <td style="text-align: center;">10 ~ 21</td> </tr> <tr> <td>Tip tube bonding</td> <td></td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">Total</td> <td style="text-align: center;">172</td> <td style="text-align: center;">90 ~ 390</td> </tr> </tbody> </table>				Pb Weight (g)		Functionality	Company A	Company B	Front glass dielectric layer	121	32 ~ 89	Adjusting the softening temperature	Rear glass dielectric layer	24	10 ~ 32	Bus electrode and black stripe	13		Barrier ribs		37 ~ 247	Sealing	14	10 ~ 21	Tip tube bonding		1	Total	172	90 ~ 390
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<p><b>2. Please explain why the elimination or substitution of the hazardous substance via design changes or</b></p>	<p><b>1) no substitute glass material exists to satisfy the needs for electric spec (contact resistance with ITO electrode) and color spec (yellow value, black value) of bus</b></p>																														

materials and components is currently technically or scientifically impracticable.

electrode and black stripe for PDP front panel

- 2) no substitute glass material exists to satisfy the needs for color spec (yellow value) of dielectric layer for PDP front panel
- 3) no substitute glass material on demand for dielectric spec and discharge spec for PDP rear panel
- 4) no substitute glass material, which gives a low softening point enough to be sintered around 450 and add moisture resistance to PDP, is available for sealing

The candidates of lead free alternatives have to satisfy the requirements below:

- 1) Capable of adjusting the softening temperature between 350 - 600 ,
- 2) Having high transparency,
- 3) Having expansion coefficient nearly equal to that of the glass substrates,
- 4) Having chemical stability inactive to the electrode material during firing.

Even though Bismuth glasses, zinc borate glasses, and tin phosphate glasses, known as the candidates of lead free alternatives, cannot be commercially applied, because they do not satisfy the all requirements for fabricating plasma display panels:

The present situation is shown bellow:

Required Properties	Lead Glasses	Lead-Free Glasses		
		Bismuth Glasses	Zinc Borate Glasses	Tin Phosphate Glasses
Softening Temperature: Adjustable between 350 – 600		×	×	
High Transparency				×
Expansion Coefficient: Same as glass substrates		×		
Chemical Stability: Inactive to electrode materials				?

: very good                      : good                      : fair  
 × : bad                              ? : no information

**In particular, when using front dielectric layer independently, firing temperature has to be higher than present materials for fitting its properties.**

**Therefore , lead free alternatives are too difficult to be applied for plasma display panels both commercially and technically .**

**3. Please indicate if the negative environmental, health and/or consumer safety impacts caused by substitution are likely to outweigh the environmental, health and/or consumer safety benefits.**

**If existing, please refer to relevant studies on negative impacts caused by substitution.**

**In particular, when using front dielectric layer, firing temperature has to be higher than present materials for fitting its properties. As the firing temperature increases, power consumption of factory increases also.**

**4. Please indicate if feasible substitutes currently exist in an industrial and/or commercial scale.**

**Please indicate the possibilities and/or the status for the development of substitutes and indicate if these substitutes will be available by 1 July 2006 or at a later stage.**

**There are no alternatives except Barrier Rib. Application is still investigated considering with the drastic change of process conditions.**

**However, lead free alternatives are too difficult to be applied commercially by 1 July 2006. The estimation when substitutions will be available is impossible.**

**5. Please indicate if any current restrictions apply to such substitutes.**

**Non**

<p><b>If yes, please quote the exact title of the appropriate legislation/regulation.</b></p>	
<p><b>6. Please indicate the costs and benefits and advantages and disadvantages of such substitutes.</b></p> <p><b>If existing, please refer to relevant studies on costs and benefits of such substitutes.</b></p>	<p><b>There is no benefits and advantages. Disadvantages are increases of power consumption and, in particular when using bithmuth glasses, material cost.</b></p>
<p><b>7. Please provide any other relevant information that would support your application for an additional exemption.</b></p>	<p><b>Please see Attachment-No.6-PDP</b></p> <p><b>... The Description for the Application for Exempting Lead in Plasma Display Panels from the RoHS Directive(2pages).</b></p> <p><b>Please see Attachment-No.6-PDP-Ref(1) ~ (2)</b></p> <p><b>... REFERENCES:</b></p> <ol style="list-style-type: none"> <li><b>(1) X X V - Bismuth trioxide glasses</b></li> <li><b>(2) The effect of stannous oxide on the properties of stannous fluorophosphates glasses</b></li> <li><b>(3) Low Melting Glasses in the System B<sub>2</sub>O<sub>2</sub>-ZnO-CaO-P<sub>2</sub>O<sub>5</sub></b></li> <li><b>(4) Density Surface Tension and Viscosity of PbO-B<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub> Glass Melts</b></li> </ol>