

Commission of the European Communities
Directorate-General for the Environment
Mr. Hans-Christian Eberl

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Application for the renewal of exemptions and proposal to prolong the validity period of exemptions pursuant to Article 5 Paragraph 3 of Directive 2011/65/EU of 8.7.2011

Subject:

- Renewal of/addendum to Exemption No. 7c. 1 in Appendix III
- Renewal of/addendum to Exemption No. 14 in Appendix IV
- Renewal/prolongation of validity period pursuant to Article 5, Paragraph 2 to 15 years

1. The exemption in Point 7c. 1 contains piezoceramic material, which is used as lead zirconate titanate (PZT) in great quantities and various forms to create high-performance piezoelectric transducers, which are a major part of equipment such as ultrasonic cleaning systems and homogenisers.

Piezoceramic "hard PZT" in the form of perforated discs is the exclusive material used for these high-performance transducers worldwide. In Europe, it bears the designation PZT 4 or PZT 8. The proportion of lead used in PZT amounts to more than 0.1% percent by weight.

2. There have been no alternatives to high-performance piezoceramic to PZT 4 and PZT 8 in the world to date. The major ceramics manufacturers (such as CeramTec, Morgan Matroc/UK, Fuji/JP, Honda/JP) have been conducting research on replacing the lead in PZT with another material for at least 10 years. There are now lead-free piezoceramics based on potassium-sodium-niobate (KNN) or bismuth-sodium-barium-titanate (BNT) for very low-power applications such as ultrasonic sensors – but no such substitutes exist for high-performance applications to date! The problem lies in the insufficient efficiency of this lead-free material and the resulting significant losses in large-signal operation at high-frequency alternating voltages of up to 1,000 V and more.

3. As a leading manufacturer of high-performance ultrasound equipment with a wide range of devices for cleaning technology and ultrasound technology for industrial, medical and laboratory applications, we achieve a total annual turnover of approx. €10 million with 100 employees. In doing so, we install roughly 70,000 perforated discs made of hard PZT 4 and PZT 8 in our high-performance ultrasonic transducers each year!

The development of high-performance piezoceramic ultrasonic transducers began in the 1950s and has undergone an enormous upswing since the invention of lead zirconate titanate materials – especially in the overall field of cleaning technology. Among other things, this led to chlorinated hydrocarbons and chlorofluorocarbons being replaced by water-based ultrasonic cleaning processes!

As an equipment manufacturer, we absolutely rely on purchasing high-performance piezoelectric ceramics made of hard PZT for the construction of high-performance ultrasonic transducers!

4. As a manufacturer of electric devices, we also work with many other electronic components, such as transistors, microprocessors, cables, etc. in addition to hard PZTs. We cannot afford to conduct analyses on alternative materials or construction elements, including the availability thereof. The piezoceramic material manufacturers listed in Point 2 (to name a few examples) are responsible for this.

5. We fulfil our duties in the disposal of electronic waste (including piezo materials) in the scope of our electronic waste registration and annual verification thereof.

6. In order to develop potential alternatives to substitute lead in high-performance piezoelectric ceramics, we are in constant contact with the manufacturers Ceram Tec and Pi Ceramic in Germany, especially for the early testing of lead-free perforated discs in high-performance ultrasonic transducers. We have already conducted such tests with samples from Honda/JP, but the results were quite negative.

7. Proposal to renew exemptions and prolong the validity period:

*Renewal/addendum Point 7c 1 in Appendix III: **Piezoelectric hard PZT containing lead for high-performance ultrasonic transducers and** Electrical and electronic components containing lead in glass or ceramic materials other than dielectric ceramic in capacitors....

*Renewal/addendum Point 14 in Appendix IV: Lead in piezoelectric monocrystals for ultrasonic transducers and in **piezoelectric hard PZT for high-performance ultrasonic transducers**

*Renewal/prolongation of the validity period pursuant to Article 5, Paragraph (2) for Category 1 to 10 exemptions pursuant to Appendix III and IV to 15 years

8. Summary

There are not expected to be any alternative materials to substitute the piezoceramic material lead zirconate titanate in the next 10 years! This is the only material that can be used in high-performance ultrasonic transducers. Piezoceramic lead zirconate titanate (PZT) as a finished individual component is neither harmful to the health nor hazardous to the environment and can be disposed of properly.

Hard PZT-based high-performance ultrasonic transducers are being produced by at least 10 medium-sized companies in Germany and are estimated to be produced by at least 30 companies in Europe.


It is not possible to substitute PZT by changing the construction of high-performance ultrasonic transducers and substituting the material with a lead-free ceramic has not been conceivable to date.

In light of these facts, we are applying for the amendments to exemptions proposed under Point 7.

Best regards,

BANDELIN *electronic*

GmbH & Co. KG


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Technical Director