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Contribution to RoHS consultation on Beryllium and its compounds

Dear Ms Baron,

Hereby you'll find Thermo Fisher Scientific's contribution to 1st Stakeholder consultation on the study to Beryllium and its compounds under RoHS2 (pack 15).

Sincerely,
Thermo Fisher Scientific

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1st Stakeholder Consultation – Questionnaire for beryllium and its compounds

Background
The Oeko-Institut and Fraunhofer IZM have been appointed[1] by the European Commission, within a framework contract[1], among others to support the review of the list of restricted substances and to assess seven substances with a view to their possible future restriction under Directive 2011/65/EU.

Beryllium and its compounds were specified in the project terms of reference for a detailed assessment. Initial substance information for **beryllium metal and beryllium oxide** are compiled and available on the substance specific webpage of the stakeholder consultation (http://rohs.exemptions.oeko.info/index.php?id=294).

Questions

1. General questions
a. In past processes for identifying substances of relevance for possible restriction under RoHS, only beryllium metal and beryllium oxide were considered. The current assessment looks at a broader scope in this respect, namely beryllium and its compounds. Please specify, should a restriction be considered, if it should be limited to beryllium metal and beryllium oxide or expanded to include beryllium and its compounds.

TFS position

As it applies to this consultation, Thermo Fisher Scientific (TFS) is a manufacturer of Professional EEE placed in Category 9, Industrial Monitoring and Control instruments of Directive 2011/65/EU. The manufactured equipment includes Electron Microscopes,X-ray and Electron Spectrophotometers such as Mass Spectrometers, XRF/XRD equipment, surface analysis and micro analysis tooling.

Beryllium metal (Be) and Beryllium Copper alloy (BeCu) is used in critical applications for the following physical properties: X-ray transparency and/or non-magnetic properties

These applications are partially covered by stake holders consultation's defined sectors and its applications. For example, Scanning Electron Microscopes are listed while Transmission Electron Microscopes also require components manufactured with Beryllium (Be) or Beryllium-Copper (BeCu) alloyed materials.. X-ray tube window application is listed in the BioMedical Sector application comprises approximately 30% of the Electron Microscope market. Therefore, the impact of a restriction is not fully covered within the consultation.
To avoid other potential exclusions and in respect to the difficulty this may cause with the socio-economic assessment, we recommend aligning sectors with the categories listed in Annex I of Directive 2011/65/EU.

Given the unique physical properties and importance of vital instrumentation to the EU Research community (outlined below), we believe a clear derogation to the proposed restriction be considered for Industrial Monitoring and Control Equipment as described in Article 5(1)(a) of Directive 2011/65/EU.

[1] The contract is implemented through Framework Contract No. FWC ENV.A.2/FRA/2015/0008 of 27/03/2015, led by Oeko-Institut e.V.

b. Please provide information to support your view, including information as to the use and presence of additional beryllium compounds in EEE placed on the EU market (e.g. beryllium–copper alloy, beryllium sulfate, beryllium chloride etc).

TFS position

The negative contribution for Environmental and Human safety aspect is relatively negligible due to the extremely long end-use period (typically up to 30 years) and limited contact during manufacture, operation and regular maintenance/repairs of Electron Microscopes and high degree of re-use, post primary lifecycle.

On the contrary, the impact of restricting Be and BeCu in Industrial Monitor and Control Instruments will have considerable negative impact on research on fundamental diseases and drugs, research to alternative energy sources, and quality control of materials and laboratory processes all beneficial to environment and human safety. In fact, XRF/XRD spectrophotometric equipment is often used to qualify components of EEE for RoHS compliance in some materials.

2. Applications in which beryllium metal and beryllium oxide are in use

a. Please provide information concerning products and applications in which the substances are in use.

TFS position

Be metal is used in X-ray applications for its transparency to X-radiation this includes X-Ray Tubing as well as adjunct equipment such as sample management devices. Furthermore, the non-magnetic properties of BeCu are of primary criticality to Electron Microscopes and X-Ray[2] or Electron Spectrophotometers where extremely small variation in the magnetic fields drastically affects performance. In considering abundant nonmagnetic alternatives, there are no known alternatives that provide the secondary requirements as outlined in Table 1 below.

At this time, there are no known alternatives to Be or BeCu for use in Electron Microscopes or X-ray or Electron Spectrophotometric applications.

Table 1: Secondary critical part properties along with non-magnetic properties of BeCu parts in Electron Microscopes

BeCu Part	Heat treatable Wear resistance & increase strength	Vacuum environment	Electrical conductive	Thermal conductive
Spring	x	x		
Screw		x	x	
Washer	x		x	
Lever	x	x		
C-clip	x	x		
Cryogenic parts	x	x	x	x

i. In your answer please specify if the applications specified are relevant to EEE products and applications or not.

[2] Adjunct equipment such as detectors, sample management devices would necessarily be included.

ii. Please elaborate if substitution of the substance is already underway in some of these applications in relation to the properties for which beryllium metal and beryllium oxide are used and/or in relation to specific applications in which it is used (for example beryllium copper alloys used in flexible contacts for batteries), and where relevant elaborate, which chemical (substance level) or technology (elimination of the need for beryllium) alternatives may be relevant for this purpose.

b. Please specify if you are aware, if aside from actual use of the substances, it may be reintroduced in to the material cycle through the use of secondary materials.

TFS position

Given the difficulty[3] in separating Be containing metals from Electron Microscopes and X-Ray and Electron Spectrophotometers at end-of-life, it is anticipated that some Be will reintroduced, c.f. section 4b.

i. Please detail in this case what secondary materials may contain impurities of beryllium or of its compounds (please specify which) and at what concentrations as well as in the production of what components/products such materials are used.

ii. If possible please provide detail as to the changing trends of concentrations of beryllium and its compounds in such secondary materials as well as the changing trend of use of the respective secondary material in EEE manufacture.

3. Quantities and ranges in which beryllium and its compounds are in use

a. Please detail in what applications your company/sector applies beryllium and its compounds and give detail as to the annual amounts of use (please specify which data is relevant for which compound). If an exact volume cannot be specified, please provide a range of use (for example – 50-100 tonnes per annum).

TFS position

The quantity of Be metal introduced to the EU market via TFS' inclusion in Electron Microscopes and X-Ray and Electron Spectrophotometers is in the range of 1 – 3 kg/yr,

b. Please provide information as to the ranges of quantities in which you estimate that the substance is applied in general and in the EEE sector.

TFS position

The market for Electron Microscopes, X-ray and Electron Spectrophotometers is driven by demand for high performance technology and competitive pricing. Information is not publicly shared and market shares can only be estimated.
Contribution of Be by Electron Microscopes is a small percentage the estimated Be usage by study of Beryllium Science & Technology Association (BeST) for EEE applications[1].

c. If substitution has begun or is expected to begin shortly, please estimate how the trend of use is expected to change over the coming years.

TFS position

No substitution has begun as alternatives are scientifically and technically have not been deemed practicable or reliable. Where possible other materials are already being used.

[3] https://circulareconomy.europa.eu/platform/sites/default/files/circular_by_design_-_products_in_the_circular_economy.pdf

4. Potential emissions in the waste stream

a. Please provide information on how EEE applications containing beryllium and its compounds are managed in the waste phase (with which waste is such EEE collected and what treatment routes are applied)?

TFS position

Industrial Control and Monitoring Equipment and especially highly expensive equipment such as Electron Microscopes, X-Ray and Electron Spectrophotometers, along with their component parts, have inherently long lifespans on the market. While TFS maintains full compliance with Directive 2012/19/EU (WEEE), the return to the recycle stream is very slow. The instruments are necessarily treated as scrap metal for recycling without specific recovery of Be.

b. In the treatment and the destruction processes of electronic components beryllium oxide can be released and result in health risks for workers. Please detail potentials for emissions in the relevant treatment and disposal processes specified relevant to each application EEE. Please also detail how such impacts can be mitigated and to what degree such practices are applied in recycling facilities in the EU and outside the EU.

TFS position

Physical separation of Be and BeCu parts is not technically feasible during the recycling of EEE, As such, the total Be TFS EEE would comprise approximately a few ppm by weight of the scrap metal.

c. Please specify if there is a risk for emissions of additional beryllium compounds.

5. Substitution

a. Please provide details as to the substitution of beryllium and its compounds (as a minimum for beryllium metal, beryllium oxide and beryllium copper alloys):

i. For which applications is substitution scientifically or technically not practicable or reliable and why.

TFS position

Be X-ray's transparency and BeCu nonmagnetic properties along with secondary properties as described (c.f.2.1) are unique. Currently, there are no known material substitutions for Be or BeCu alloys in Electron Microscopy or X-ray or Electron Spectrophotometers.

ii. For which application is substitution underway. Please specify in this respect which alternatives are available on the substance level (substitution) and which are available on the technological level (elimination) and in which of the beryllium applications they can be applied (for example which substitutes cab be applied for copper beryllium alloys used in flexible contacts for batteries) .

iii. What constraints exist to the implementation of the named substitutes in a specific application area (provide details on costs, reliability, availability, roadmap for substitution, etc.)

6. Socio economic impact of a possible restriction

Please provide information as to the socio-economic impacts of a scenario in which beryllium metal and beryllium oxide or beryllium and its compounds are restricted under RoHS. Please specify your answers in relation to specific applications in which the substances are used and/or in relation to the phase-in of specific alternatives in related application areas. Please refer in your answer to possible costs and benefits of various sectors, users, the environment, etc. where possible; please support statements with quantified estimations.

TFS position

Life Science and Material Science disciplines require access to Electron Microscopes and X-Ray and Electro Spectrophotometers. There would be an irreversible damage to these disciplines and markets as well as on the downstream community if this equipment were made unavailable in the EU Community. For example, certain facets of drug development and advancement of basic research would be impossible, as evidenced by the 2017 Nobel Prize in Chemistry awarded to researchers studying proteins that cause antibiotic resistance to the surface of the Zika virus)[4].

Similarly, the proposed restriction would limit advances and availability of high-tech materials used in pharmaceutical, telecommunications, alternative energies, amongst others.

7. Further information and comments

The information compiled on these substances for the stakeholder consultation has been prepared as a summary of the publicly available information reviewed so far. If relevant, please provide further information in this regard, that you believe to have additional relevance for this review, as well as references where relevant to support your statements.

In case parts of your contribution are confidential, please clearly mark relevant text excerpts or provide your contribution in two versions (public /confidential).

Finally, please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that Oeko-Institut can contact you in case there are questions concerning your contribution.

[4] https://www.nobelprize.org/nobel_prizes/chemistry/laureates/2017/press.pdf