Abteilung Umweltschutzpolitik

14. Juni 2018
STN

ZVEI Answers to

1st Stakeholder Consultation – Questionnaire for beryllium and its compounds

Abbreviations

EEE	Electrical and Electronic Equipment
EU	European Commission
IZM	Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration
RoHS	Restriction of certain Hazardous Substances

Background

The Oeko-Institut and Fraunhofer IZM have been appointed 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 (RoHS 2).

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).

The questions below outline the need for information.

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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.

The function of Beryllium in electronic and electrical technic is to harden the soft copper or nickel alloy and to make it applicable for the function of springs. Therefore Beryllium is present as a component of the alloy and it is bound to the matrix. Usually a very low amount of beryllium in the alloy is sufficient to obtain the required macroscopic properties of the alloy.

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.).

The use of beryllium in EEE is covered by beryllium as alloying element in copper or nickel.

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

a. Please provide information concerning products and applications in which the sub-stances are in use.

Copper beryllium is used for

- SMD Contact Springs
- Electronic connectors and small springs.
- Contact springs of relays,
- Contact springs for components for Electromobility
- Push buttons
- Contactor, Switch
- Snap springs
- Battery contacts

Nickel beryllium is used for

- Snap springs

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

Beryllium is used as an alloying element in copper or nickel and provides excellent properties, which are necessary for the function of contact springs/SMD-springs/snap springs. Characteristics are:

- High Conductivity (electrical and thermal)
- precipitation hardening in other metals, especially copper
- good spring characteristics, resilience and ductility
- Good corrosion and oxidation resistance
- Excellent metalworking, forming qualities

- Low material exhaustion
- solderable material

CuBe2 shows following characteristics
- Electromagnetic compatibility (EMC) (“nonmagnetic”)

NiBe2 shows following characteristics:
- good spring characteristics (e.g. resilience) even in high temperature applications

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.

Please refer to our answer to 5. Substitution.

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.

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.

CuBe2 and NiBe2 contains beryllium as an alloy in a concentration up to 2%.

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 com-pounds 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).

Beryllium is used in application like Copper/Nickel -Beryllium, which is used for contact spring, snap springs and SMD- spring. For example, these contact springs are necessary for components which are installed in charging systems for electromobility.

4. Potential emissions in the waste stream

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.

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.

A substitution of Copper-Beryllium for construction elements of electrical contact and connection technology is technically not feasible in almost all known cases. Material properties like durability, good spring characteristics, resilience and ductility and Electromagnetic compatibility can't be achieved for small springs with alternative alloys. Especially for the use of small contact springs, properties of Beryllium-Copper like flexibility and ductility, are necessary to form small sizes.

For the use of CuBe alloy in special contact springs in the electrical industry, the CuBe-part is formed by punching and bending as well as rolling from a sheet of metal. The so formed part is used in the function of a clamping ring for specifically constructed brass contacts. For this arrangement, no other material has so far been able to achieve a comparatively enduring mechanical preloading and good vibration resistance of the spring.

The decisive technical parameters for the selection of CuBe alloy for such constructions is the relation of the spring rate of the material to the wall thickness.

A substitution of Copper/Nickel-Beryllium for the application of snap springs is due to the above mentioned characteristics not feasible. Especially in high temperature application a substitution of NiBe2 is even more difficult.

Copper beryllium is used for electric components (lamella contacts) in charging systems. These power charging systems are essential to implement an infrastructure for electromobility and to meet the global goals for CO2 emission. The high spring characteristics and high conductivity of CuBe are essential for these applications. There is no other material known with comparable properties, e.g. NKT322 GIGALLOY achieves only about half of the conductivity of CuBe.