MATERION

FREQUENTLY ASKED QUESTIONS

Frequently Asked Questions about Recycling of Electrical and Electronics Equipment Containing Copper Beryllium Alloys

FAQ 112

Is electrical and electronic equipment (EEE) containing copper beryllium alloys safely recyclable?

Yes. Results from surveys conducted at a facility processing EEE scrap show that controls in place for other metals, such as lead and cadmium, are sufficient to control airborne beryllium to well below 0.2 µg/m^3. This level is the recommended exposure guideline (REG) of Materion Brush Inc. Inc. and the Permissible Exposure Limit (PEL) contained in the new Beryllium Standard for General Industry (29 CFR 1910.1024) issued in January 2017 by the United States Occupational Safety and Health Administration (OSHA). Cases of chronic beryllium disease (CBD) have not been observed when airborne beryllium levels are kept consistently below 0.2 µg/m^3.

How is EEE scrap handled during recycling?

Whole circuit boards or cellular phones are first mechanically shredded into one square inch pieces. A small fraction of the shredded EEE is then processed further to determine the content of precious metals such as gold, silver and platinum. The shredded sample is then roasted in an oven to remove all combustible materials. The roasted material is then milled to produce a uniform mixture for testing and further processing. The last step involves adding the milled material to a molten copper alloy to collect the precious metals. Ingots are cast from the furnace and then a sample of the ingot is assayed for gold, silver, platinum and other metals.

What were the details of the surveys?

Exposures to airborne metals were measured during the processing of scrap cellular phones and printed circuit boards. Operations tested were shear shredding, roasting, milling, and melting and casting. These four steps are typically used by EEE scrap processors. Processing equipment can vary from facility to facility, but the goal is to reduce the size of the EEE scrap material and produce a uniform mixture for testing, valuation and further processing. These operations can create dust leading to potential worker exposure for any compound found in consumer electronic products such as cell phones and personal computers.

Fifteen personal air samples were collected on each of the operators of the four processes. The air samples were analyzed for aluminum, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, silver and zinc. The concentration of these metals in the cellular phones and printed circuit boards was also measured during the studies.

Airborne exposures to beryllium (an alloying element in copper beryllium) were found to be well below the Materion Brush Inc. REG and the OSHA PEL. Airborne exposures to other metals, including aluminum, arsenic, cadmium, chromium, iron, manganese, nickel selenium and zinc, were found to be below the relevant occupational PEL's. Silver exposures in shredding, roasting and alloying were slightly elevated with exposures at the milling operations in excess of both the OSHA and European Union PELs. Exposure results at the milling operation were also above the OSHA PEL for copper and lead.

The mean concentration of beryllium was 10 ppm in the printed circuit board samples and 52 ppm in the cellular phones analyzed in the study. The quantity of beryllium contained in electronic scrap is typically less than 50 ppm.

Silver concentrations in EEE are expected to increase in the future, possibly increasing worker exposure to silver, as lead-based solders are phased out of EEE and replaced with silver-based solders in response to the EU RoHS and WEEE Directives.

What happens to the metals in EEE?

The copper and precious metals are melted and cast into ingots and recovered for reuse. Other metals contained in the printed circuit boards or cellular phones, such as beryllium, nickel, cadmium, chromium, lead and iron, end up in the melting furnace slag or dross. The slag and dross can be further processed to recover other metals.

How can I obtain assistance?

If you have any questions regarding the above information, please contact your sales representative; our sales department at +1-216-486-4200; or the Product Safety Hotline at 1-800-862-4118 (in the U.S.) or +1-216-383-4019 (outside the U.S.). This document, as well as other product specific safety data information, can be found at www.materion.com. Additionally, information on the Beryllium Worker Protection Model and process specific safety guidance can be found in the Interactive Guide to Working Safely with Beryllium and Beryllium-containing Materials at www.berylliumsafety.com.