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Posted by Anonymous on Tue, 2015-01-13 15:23

Gallium Metal: Hi, I was wondering what your thoughts were on the use of gallium in schools (Years 7–12) for the purpose of demonstrating the melting point of metals and possibly other experiments. Is it considered safe for students to handle assuming they're wearing gloves?

Voting:



No votes yet

Year Level:

7
8
9
10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

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Metal

Submitted by sat on 02 February 2015

Thank you for your excellent question. Yes, from the available information, metallic gallium can be safely stored, managed and used within a school science context. From a curriculum perspective, it provides an excellent example of metal properties, low melting point (29.8 °C),

metallic lustre, and high density (5.9). In this context, it offers a much safer alternative to mercury as an example of a low melting point metal.

Gallium is regarded as comparatively non-toxic. However, as gallium is not a commonly used element, the body of knowledge of its properties is not as extensive as for more common metals. Therefore, Science ASSIST recommends that a site-specific risk assessment should be conducted before use, and that gallium is used as a teacher demonstration due to the high cost of this element.

Gallium is insoluble in water and unlikely to be absorbed by the skin during handling. There are some reports of skin sensitivity leading to dermatitis. Wearing of thin disposable gloves is recommended.

Eye protection should also be worn.

At room temperature, there is no inhalation hazard and the metal is non-corrosive to plastics. It is considered corrosive to metals, so contact with metals, especially aluminium and aluminium alloys, should be avoided. Some gallium compounds are known to be toxic and contact of the metal with strong acids, strong bases, oxidising materials and halogens should be avoided.

Spills can be cleaned up by pouring ice water over the spill to freeze the gallium, which can then be scooped up with a spatula. Gallium is electrically conductive, so any spills into or onto powered equipment need to be treated with caution. If gallium is spilt on electrical equipment, the power must be switched off before attempting to clean it up.

Storage

Gallium is best stored in its original container. However, as it expands and contracts with temperature change, storage in a glass or metal container is not recommended. If repackaged, it can be safely stored in a polyethylene container. Storage in the fridge (2–8 °C), is also recommended, as the metal will remain solid, which minimises its absorption of oxygen from the air and therefore slows its rate of oxidation.

Activities

As one likely activity would be to demonstrate that gallium melts in the hand, wearing thin disposable gloves should allow this to happen. Used gloves can be disposed of in general waste.

Gallium is the metal used in the classic “disappearing teaspoon” demonstration. The references below include video clips of this activity, and overseas sites offering gallium and silicone rubber moulds for recasting spoons from the molten metal. Clearly a risk assessment of this activity would include steps to ensure that the stirred liquid is not ingested, and that the gallium spoons do not come into contact with foods.

Some additional information regarding gallium and its uses can be found here:
<https://pubs.usgs.gov/fs/2013/3006/pdf/fs2013-3006.pdf>

Availability and price

Unfortunately gallium is a very expensive substance, and its cost is likely to be prohibitive to schools. It could perhaps be considered for demonstration purposes. There are several reasons for this high cost.

- Gallium is a very uncommon low-use element.
- Because of its use in electronics, gallium is available only in very high purity, with the lowest available grade being 99.99%. This increases the cost.
- Gallium is a Class 8 Dangerous Goods (UN 2803), and is thus very expensive to transport and import. Our advice from importers of chemicals is that, even for the online purchase of gallium from overseas suppliers, such as those given in the references below, there would be added transport and import costs.

Science chemicals wholesale company Chem-Supply does not currently hold stocks of gallium, but gives the following indicative school retail prices for 99.99% pure gallium:

- 50 grams—\$492
- 10 grams—\$123

It is available for purchase from some Australian sources such as Sigma-Aldrich. For current prices and availability see:

<http://www.sigmaaldrich.com/catalog/product/aldrich/263265?lang=en®ion=US>

These prices would not include GST or the extra costs of delivery to school sites.

References:

Wilkinson, S. Personal communication. ChemCentre. Western Australia.

Safety Data Sheets:

<http://www.espimetals.com/index.php/msds/135-Gallium>

<http://www.sigmaaldrich.com/MSDS/MSDS/PleaseWaitMSDSPage.do?language=&co...>

Melting spoon activity:

<https://boingboing.net/2011/02/27/howto-make-a-disappe.html>

<https://www.rotometals.com:443/gallium-disappearing-spoon-mold-make-it-yourself/>

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