Disposal of calcium metal

Posted by Anonymous on Mon, 2015-08-24 11:13

Calcium Metal: Can you please tell me how I can safely dispose of a very small amount of Calcium metal, which has not been used for a long time. The outside of the can has become rusty, so I have placed it inside another container.

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Calcium Metal

Submitted by on 02 September 2015

Calcium is usually supplied in the form of dry granules. However, in the past, calcium has also been available as granules under paraffin oil. If you have waste calcium under paraffin oil, we recommend that you dispose of it via a licenced waste disposal contractor.

Over time, calcium metal will react with oxygen in the air to give calcium oxide, which can then

absorb water to give calcium hydroxide, or react with carbon dioxide to give calcium carbonate. The calcium oxide, hydroxide and carbonate all form a white coating on the surface of the metal pieces.

$2\ Ca + O_2 \rightarrow 2\ CaO$

$CaO + H_2O \rightarrow Ca(OH)_2$

$CaO + CO_2 \rightarrow CaCO_3$

To destroy waste calcium metal, it is recommended that the calcium be added to water in portions in the ratio of 1g per 100mL.[1,2] The mixture should be stirred until the reaction is complete.

$Ca + 2\ H_2O \rightarrow Ca(OH)_2 + H_2$

Calcium metal reacts with water to give calcium hydroxide and hydrogen gas. Hydrogen gas is flammable, and therefore it is important to carry out this reaction in a well-ventilated area or in an operating fume cupboard. Slow addition of the calcium to the water will also help to avoid a build up of hydrogen gas.

As the calcium is added to water and calcium hydroxide is formed, this will give a white precipitate, as calcium hydroxide is not very soluble. If the calcium has degraded to the practically insoluble calcium carbonate, this will also give a white precipitate when it is added to water.

When the reaction is complete (no further evolution of hydrogen gas), neutralise the solution with dilute hydrochloric acid (2–5M) to between pH 6 and 8. The pH can be measured using universal indicator, or another pH indicator such as phenolphthalein, or pH paper, or with a pH meter. After neutralisation with hydrochloric acid, the solution should be clear and can be disposed of down the sink. 200 mL of 5M hydrochloric acid will theoretically neutralise a solution prepared using 20 g of pure calcium metal.

Take care not to overshoot the neutral point, by adding the acid slowly while monitoring the pH, and using a lower concentration of acid when the pH is getting close to the endpoint. Hydrochloric acid is a suitable acid to use for the neutralisation step because it gives a solution of soluble calcium chloride. Acetic acid (ethanoic acid) is also suitable for neutralising calcium hydroxide solution. Sulfuric or citric acid are not suitable for this purpose as they would give the much less soluble salts calcium sulfate and calcium citrate respectively.

We recommend disposing of calcium by this method in small batches (10–20 g) of the metal, slowly adding this quantity of the metal to water in a large beaker or a bucket. Alternatively, or for large amounts of waste calcium, or where the calcium is stored under oil, the waste metal can be disposed of via a licenced chemical disposal contractor.

References

1. Fink, R. C., Lunn, G. and Sansone, E. B., Destruction of Hazardous Chemicals in the Laboratory (3rd edition), John Wiley and Sons, **2012**, p. 39.

2. Lunn, G. and Sansone, E. B., Safe disposal of highly reactive chemicals, J. Chem. Educ., **1994**, *71*, p. 972.
