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Disposal of potassium permanganate and glycerol reaction

Posted by Anonymous on Fri, 2019-08-09 17:40

Disposal of potassium permanganate and glycerol reaction: How do I safely dispose of the products of the exothermic reaction between potassium permanganate and glycerol conducted in a mortar and pestle? I am not sure of the quantities used, so how do I know if there are any unreacted chemicals present that may still self-ignite?

Voting:



No votes yet

Year Level:

10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

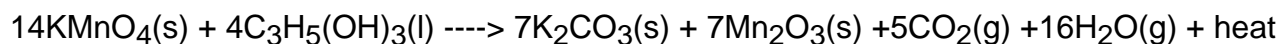
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Disposal of potassium permanganate and glycerol reaction

Submitted by sat on 09 August 2019

The reaction of potassium permanganate and glycerol:

This reaction is an example of a spontaneous exothermic reaction in which glycerol is oxidised to carbon dioxide and water (as steam) by potassium permanganate. The reaction may take some time to start, but as heat is produced the reaction speeds up, with the main reaction being:



Other manganese species are thought to be produced in the reaction, such as Mn(VI) as green potassium manganate, and Mn(IV) as black manganese oxide.

As it is difficult to determine if there are unreacted chemicals present, we recommend quenching the reaction mixture with water. This can be done by submerging the reaction vessel in a container of water (e.g. an ice cream container).

Given that you are not aware of the quantities of the reactants, if the water is coloured a deep pink it is likely that there is an excess of potassium permanganate. It is good practice to reduce the permanganate to a less reactive species, such as Mn(II) or Mn(IV).

Disposal of products if this has been conducted on a large-scale:

Reduce the manganese species to manganese dioxide and save for disposal by a chemical waste disposal contractor as follows:

- Wear PPE (i.e. closed in shoes, lab coat, safety glasses, nitrile gloves)
- Place the container (or bucket) in a spill tray in a fume cupboard.
- Add to this a reducing agent such as dilute hydrogen peroxide (3-6%) or a dilute (10%) solution of sodium metabisulfite or sodium sulfite.
 - Add the reducing agent in portions and allow time between additions for the reaction to proceed.
- The manganese should precipitate as black manganese dioxide. Collect the precipitate by filtration, allow it to dry, and store as manganese waste.
- Neutralise the filtrate solution to within pH 6-8 and wash down the sink.

Disposal of products if this has been conducted on a small scale and to clean the residue from reaction vessels:

- Wear PPE (i.e. closed in shoes, lab coat, safety glasses, nitrile gloves)
- Place the container (bucket) in a spill tray in a fume cupboard.
- To the solution containing manganese and glycerol waste, add dilute (e.g. 1-2M) sulfuric acid so that the pH is below 3.
- Add to this a reducing agent such as dilute hydrogen peroxide (e.g. 3-6%) or a dilute (10%) solution of sodium metabisulfite or sodium sulfite.
 - Add the reducing agent in portions and allow time between additions for the reaction to proceed.
 - Continue to add portions of the reducing agent until the solution becomes clear.
 - (The aim is to reduce the manganese species to Mn(II), as a pale pink solution of manganese sulfate, MnSO_4 .)
- The solution of manganese sulfate can then be neutralised to within pH 6-8 and washed

down the sink.

- If treating a large quantity of the manganese residue, the Mn(II) solution should be disposed of gradually over several days. Alternatively, the Mn(II) ions can be precipitated as manganese carbonate as follows. Transfer the Mn(II) solution into a beaker or other suitable vessel. Slowly add sodium carbonate solution until there is no further precipitate of white manganese carbonate. Note that the carbonate solution will also react with the acid, and carbon dioxide will effervesce. Collect the precipitate by filtration, allow to dry, and store for collection as manganese waste or heavy metal waste. Neutralise the supernatant solution to within pH 6-8 and wash down the sink.

Recommendations for conducting this activity:

If your school chooses to conduct this activity, we recommend using the method and scale available through the Royal Society of Chemistry¹ for the following reasons:

- The activity is conducted on a small scale, using about 2–3 g potassium permanganate and 1 mL glycerol
- The reaction occurs on a metal lid or a foil pie dish (on a bench protector), which is easy to treat and dispose of.

Safety Notes:

- Students and teacher should wear safety glasses
- This should be conducted in a fume cupboard or a well-ventilated area with safety screens to protect both the teacher and the students, under a high ceiling of at least 2.5-3m above the reaction and not under smoke/heat detectors or any combustible materials.
- It is important that the products of this reaction are not discarded into the general waste, as this has been known to ignite later.

References and further reading

¹'Spontaneous exothermic reaction', Royal Society of Chemistry website, <https://edu.rsc.org/lcredir/learn-chemistry/resource/res00000742/spontaneous-exothermic-reaction?cmpid=CMP00005910> (September 2016)

Flinn Scientific. 2017. *The Reaction of Potassium Permanganate with Glycerin*. Flinn Scientific website, <https://www.flinnsci.ca/api/library/Download/4ebf31df9511493db327d5d958512ef4>

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