Phenanthroline

Posted by Anonymous on Sat, 2018-08-18 10:47

Phenanthroline: My Chemistry teacher would like to use Phenanthroline for senior chemistry EEI's. The MSDS lists this chemical as Acute hazard category 1, and Acute toxicity oral category 3. Could you tell me if this chemical is ok to use in schools?

Voting:
No votes yet

Year Level:
7
8
9
10
Senior Secondary
Laboratory Technicians:
Laboratory Technicians

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Answer by labsupport on question Phenanthroline

Submitted by sat on 18 August 2018

Answer reviewed 31 January 2023

It is important to understand that there are variations between the policies of the different educational jurisdictions regarding chemicals that can be used in school science. You are advised in the first instance to consult with your school jurisdiction policies and procedures for

specific chemical use. Phenanthroline (1,10-phenanthroline) is not on any banned or restricted list in any of the Australian jurisdictions.

Before purchasing any chemical, a site-specific risk assessment should be conducted taking into consideration the hazards of the chemical, how it will be used, stored and the products of any chemical reactions.

Although, the solid chemical is toxic if swallowed and very toxic to aquatic life[1,2], the solution is considered not hazardous.[3] Schools may consider purchasing the chemical in solution form (0.1% phenanthroline also listed as Ferroin indicator solution) rather than prepare the solution on-site, although this can be done using safe handling procedures.

Phenanthroline is generally used by students as a dilute solution as an indicator to detect iron in water in redox reactions. Iron exists in water predominantly as Fe3+ and this first has to be reduced to Fe2+ with the addition of a reducing agent. The iron (II) ions form a complex with the phenanthroline producing an intense orange/red colour. The concentration of the iron present in the water sample can then be measured using a spectrophotometer and a calibration curve. Redox indicators are normally used in very small amounts, typically a few drops of a dilute solution therefore, with safe handling procedures, phenanthroline is suitable for use in school science.

Hazards of phenanthroline in solid form:

“Hazardous to the aquatic environment - Acute hazard category 1” Under the GHS, in Australia it is not mandatory to classify according to environmental hazards. However, this does alert the user to risks to the environment and as such the SDS also includes the statements ‘Avoid release to the environment’ and ‘Do not allow to enter water ways, waste water or soil’. This hazard is important when considering the disposal of this chemical and as such should be disposed of by a chemical waste disposal contractor.

“Acute toxicity oral category 3” Under the GHS, category 3 is less hazardous than categories 1 and 2. This chemical carries the hazard statement ‘Toxic if swallowed’ and the precautionary statement ‘wash thoroughly after handling’. Wearing appropriate PPE and good laboratory hygiene is essential to minimising the risk of ingesting this chemical.

The use of the following safe handling procedures will control and reduce the risks when handling this chemical in solid form.

Safe handling procedures

- Consult the information contained in the Safety Data Sheet.
- Do not breathe dust, vapour or mists and avoid eye and skin exposure.
- Wear suitable PPE such as safety glasses, gloves, enclosed shoes and laboratory coat.
- Conduct good laboratory hygiene such as cleaning up spills, no eating or drinking in the lab and washing hands at the end of all laboratory activities.
- Avoid contact with strong oxidising agents and nitric acid.
- The solid chemical is hygroscopic. Store in a cool, dry, dark place.
- Avoid release to the environment.

References and further reading

[1] Sigma-Aldrich. 2013. *1,10-Phenanthroline.* Please see the Sigma Aldrich website for the latest version of the Safety Data Sheet: https://www.sigmaaldrich.com/AU/en

[2] Sigma-Aldrich. 2019. *Ferroin indicator solution*, Please see the Sigma Aldrich website for the latest version of the Safety Data Sheet: https://www.sigmaaldrich.com/AU/en

[3] Flinn Scientific. 2017. *Determination of Iron in Water*, Flinn Scientific website, https://www.flinnsci.com/determination-of-iron-in-water/dc0585/
