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Posted by Anonymous on Thu, 2015-05-21 12:28

Disposal of reactants of chemical clock activity:

Chemical clock practical: My chem teacher would like to do a chemical clock prac with ferric nitrate and sodium thiosulfate, using metal ions as catalysts. How should I best dispose of the end products?

Voting:



No votes yet

Year Level:

10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

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chemistry

Submitted by on 30 June 2015

Answer reviewed 26 February 2023

We have sought the advice of water authorities across Australia on the most appropriate way to dispose of the waste from this experiment. Taking into consideration the total volume of waste water generated by a school, and assuming that the science labs have a neutralisation/dilution tank installed, the waste from this experiment should be sufficiently dilute to dispose of down the sink. Additionally, as this would be a senior chemistry activity, it would only be conducted once or twice per year and the mass load of chemicals produced would be very small. Schools in rural or remote areas without access to deep sewerage should consult their local water authority for specific advice for their region.

Based on a class of 30 students working in pairs, we calculated the concentrations of the metal ions and sulfur species in the waste solutions from this activity¹ and compared this data against the trade waste acceptance criteria from water authorities around Australia.

While the concentrations of the metal ions in the waste solutions would be within the accepted levels for trade waste, the concentration of sulfur species would be in excess of that accepted by water authorities. The more stringent criteria for the acceptance of waste sulfur are required because of the potential for sulfur oxyanions to be reduced by bacteria to the toxic and corrosive hydrogen sulfide, which can create a health hazard for water authority workers and corrode the pipework.

We considered the overall volume of waste water produced per day in a school, based on conservative estimates² of the volume of water consumed per student per day. Most science labs in schools would also have a neutralisation or dilution tank installed so that all waste water from science would be retained in the tank before entering the school's internal sewerage system. Waste water in the dilution tank feeds slowly into the other waste streams from the school and thus is further diluted.

Taking these factors into consideration, we calculated that the sulfur waste produced would be diluted to an acceptable concentration. The mass load for one class carrying out this activity would also be very small. We assume that this activity would be carried out by senior chemistry classes, and therefore would only be conducted once or twice per year for a particular school.

For experiments which generate concentrated waste solutions of metal ions, we advise that the waste should not be disposed of down the sink, but should be stored for collection by a licenced waste disposal contractor. Alternatively, the metal ions can be precipitated and the solid precipitate stored for collection.

References

1 Royal Society of Chemistry Education, 'Catalysis of a sodium thiosulfate and iron (III) nitrate reaction', 2023, <https://edu.rsc.org/experiments/catalysis-of-a-sodium-thiosulfate-and-ir...>

2 'Water audit: How water efficient is my school?' Resources for Teachers and Students, Sydney Water: <https://www.sydneywater.com.au/education/programs-resources/high-school/...>

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