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Posted by Anonymous on Thu, 2015-09-24 10:14

Use of iron III nitrate and zinc nitrate: Is it still okay to use iron III nitrate and zinc nitrate, as they are not listed on the Recommended List of Chemicals for Schools. We currently make up 0.5 M solutions of each to use in Year 11 & 12 Chemistry to look at half cells and the electrochemical series. Should we continue to use them and/or are there recommended alternatives?

Voting:



No votes yet

Year Level:

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

Showing 1-1 of 1 Responses

Use of Iron III Nitrate and Zinc Nitrate

Submitted by sat on 14 January 2016

Answer reviewed 26 February 2023

Half-cell reactions

Both these chemicals are on the [List of recommended chemicals for science in Australian schools 2021](#) therefore you can continue to use these chemicals. We suggest using iron (II) sulfate, rather than iron (III) nitrate, in an Fe/Fe²⁺ half-cell (or using a mixture of iron (II) sulfate and iron (III) sulfate, if you are preparing an Fe²⁺/Fe³⁺ half-cell).

Concentrations of 0.5 M achieve a better voltmeter reading than 0.1 M solutions. Aqueous solutions of nitrates are usually used in half-cells as the nitrate ions will not interfere with the electrochemical reaction by being oxidised or reduced and will not form any precipitates.

A half-cell consists of an electrode partially immersed in an aqueous solution. A potential difference is developed between the positively charged solution and the negatively charged electrode when connected to a standard hydrogen electrode. A number of different half-cells can be used.

Typical half-cells

- Copper metal in an aqueous solution of copper (II) nitrate
- Zinc metal in an aqueous solution of zinc (II) nitrate
- Magnesium metal in an aqueous solution of magnesium nitrate
- Aluminium metal in an aqueous solution of aluminium nitrate

Note: Aqueous solutions of the metal sulfates can also be used for the copper, zinc, magnesium and aluminium half-cell.

- Iron metal in an aqueous solution of iron (II) sulfate
- Lead metal in an aqueous solution of lead (II) nitrate

Note: Before using lead or its compounds, a risk assessment should be prepared taking into consideration its toxicity, level of student competence, concentration and quantities used and disposal.

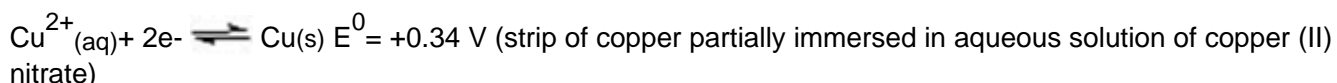
Science ASSIST recommendations

- Consult SDSs before using any chemicals.
- Safety glasses and lab coats should be worn throughout the laboratory activity.
- Follow general laboratory hygiene rules, such as washing hands before leaving the laboratory.
- All used solutions should be collected in a heavy metal wastes container.
- Metal strips can be cleaned and reused.

Additional information

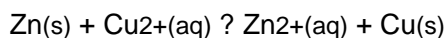
An electrochemical cell comprises of two half-cells joined by a salt bridge. In one half-cell, oxidation of a metal electrode occurs, while in the other half-cell there is the reduction of metal ions in solution. The half-cell with the most negative electrode potential forms the negative terminal (anode). Oxidation occurs at the anode. Reduction occurs at the positive terminal (cathode). The salt bridge usually contains a saturated solution of sodium or potassium nitrate or chloride. The salt bridge allows the flow of ions from one half-cell to another without the mixing of the two solutions. The salt bridge also maintains electrical neutrality of the solutions in the two half-cells and completes the electrical circuit.

Consider the electrochemical cell consisting of the 2 half-cells expressed in the following half equations:



Copper (II) ions have a higher standard electrode potential value and are a stronger oxidant than zinc ions. At the zinc anode, Zn^{2+} ions are released into the solution of the half-cell while at the copper cathode, Cu^{2+} ions are reduced to metallic copper.

The overall equation is:



References

Chem Supply website, (2020). *Iron (III) nitrate*, Safety Data Sheet. Search <https://www.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

Chem-Supply. (2021). *Zinc nitrate*, Safety Data Sheet. Search <https://www.chemsupply.com.au/> to source the latest Safety Data Sheet via the product information page.

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