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Ammonium nitrate

Posted by Anonymous on Fri, 2015-07-31 16:20

Ammonium nitrate: Hi, Has anyone else had any trouble with ammonium nitrate absorbing water? Mine has become a clear mixture of liquid and crystals. The crystals are a solid lump that needs to be prodded to separate. It was suggested by one of my teachers to place it in the oven to dry it out. I'm not in favour of doing this procedure, and so I won't be taking his advice.

Voting:



No votes yet

Year Level:

7

8

9

10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

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Ammonium nitrate

Submitted by on 20 August 2015

There was a NSW directive to dispose of ammonium nitrate in excess of 3kg in 2006 by using it as a fertiliser on school grounds. You should not subject it to any heat.

You can easily substitute for the cation and anion, however, if using for endothermic reactions, use sodium nitrate instead.

Ammonium nitrate

Submitted by sat on 12 August 2015

Answer reviewed 10 February 2023

When ammonium nitrate has absorbed moisture, it is very challenging to dry it out.

Science ASSIST **strongly advises not to heat** ammonium nitrate under any circumstances because of the hazards of decomposition or explosion, which could be triggered by contamination and other factors.

Before handling a chemical, the first port of call **must** be to consult the Safety Data Sheets (SDSs), which contain important safety information.

- Ammonium nitrate is hygroscopic and absorbs water from the atmosphere. If kept at high humidity, ammonium nitrate can dissolve in the water it has absorbed due to its deliquescent nature. Therefore, it should be stored in a cool, dry place. It could be stored in a desiccator to prevent it absorbing moisture from the surrounding air and coalescing into a large solid lump.
- Ammonium nitrate is also a powerful oxidiser, so it should also be kept away from heat, hot surfaces, open flames, combustible materials and other sources of ignition.
- Ammonium nitrate is not combustible, however, being a strong oxidant, it can intensify the development of a fire involving combustible materials such as rags, wooden articles, clothing and plastics. It can also cause skin irritation.
- When ammonium nitrate is heated, it decomposes to give off toxic gases. Heated in an open, well-ventilated space, it decomposes completely to give nitrous oxide, ammonia and nitric acid with white fumes and vapours. If heated in confinement (e.g. in an oven), or in the presence of contaminants or both, ammonium nitrate will decompose to give brown toxic fumes of nitrogen dioxide.
- In extraordinary circumstances, ammonium nitrate can detonate as an explosive. Factors such as contamination or confinement can increase the explosive sensitivity of ammonium nitrate. Thus, ammonium nitrate is widely used in the manufacture of explosives.
- Ammonium nitrate is also known as Security Sensitive Ammonium nitrate (SSAN) and is therefore subject to state government legislation. Under this legislation, it is only permitted in schools in quantities up to 3kg and in some jurisdictions is subject to certain paperwork requirements, such as applying for an exemption and/or ordering using an End User Declaration (EUD). Consult your state regulator for more information.

Recommendations

Science ASSIST recommends that you do one of the following with your deliquesced ammonium nitrate, depending upon the quantity.

- Remove the excess solution from the salt and greatly dilute the solution so that it can be spread on the garden as a fertiliser.
- Weigh the remaining mass and treat it as the dry salt in making up a solution. E.g. approximately 2M or 4M depending upon the amount. This can always then be diluted further if required.

- Dissolve most of it in a limited amount of distilled water at 20°C to form a saturated solution. Given that ammonium nitrate has a solubility of 150 g/100 mL at 20°C, a saturated solution can be calculated to be approximately 18.7 M. Keep this as a saturated solution and use for the purposes of a salt bridge, or dilute as required.

Science ASSIST also recommends

- Safe handling: Ammonium nitrate should only be used in a well-ventilated area and appropriate PPE such as protective clothing, nitrile rubber gloves and safety glasses should be worn.
- Alternative chemical: In jurisdictions where ammonium nitrate is not permitted, or to avoid the difficulties of storage, consider alternatives such as ammonium salts and nitrate salts that can be used instead of ammonium nitrate.

For more information also see the [Science ASSIST Chemical Management Handbook for Australian Schools - Edition 3](#)

References

Cagnina Stefania, Patricia Rotureau and Carlo Adamo. (2013). 'Study of Incompatibility of Ammonium Nitrate and its Mechanism of Decomposition by Theoretical Approach' *Chemical Engineering Transactions* . Vol 31. <https://www.cetjournal.it/index.php/cet/article/view/CET1331138>

Science ASSIST. (2018). *Chemical Management Handbook for Australian Schools – Edition 3*, Retrieved from the Science ASSIST website: <https://assist.asta.edu.au/resource/4193/chemical-management-handbook-au...>

Sigma-Aldrich, (2022) '*Ammonium nitrate Safety Data Sheet*'. Please search the product information page on the website for the latest version for ammonium nitrate on the Merck website: <https://www.merckmillipore.com/AU/en>

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