



ASSIST

AUSTRALIAN SCHOOL SCIENCE
INFORMATION SUPPORT FOR
TEACHERS AND TECHNICIANS

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potassium bromate

Posted by Anonymous on Mon, 2015-03-30 10:08

potassium bromate: I am wondering if it is safe/acceptable to order potassium bromate in solid form for a visually impressive science reaction for open day purposes. Are there any special considerations associated with this chemical, as I believe it can be quite hazardous? The teacher hopes to use the whole amount of potassium bromate ordered within a few days of ordering, so it would not be stored indefinitely in our chem room.

Voting:



No votes yet

Year Level:

7

8

9

10

Senior Secondary

Laboratory Technicians:

Laboratory Technicians

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potassium bromate

Submitted by sat on 16 April 2015

Answer reviewed 24 February 2023

Thank you for taking the time to check on the appropriateness of the use of this chemical. The response to your question is not a simple one.

Summary Response:

Science ASSIST recommends that, in general, potassium bromate is not stored or used in schools. *Potassium bromate KBrO_3 is an extremely hazardous chemical. It is a very strong oxidising agent with the capacity to form explosive mixtures with combustible materials. It is also extremely toxic and is classified as a carcinogen.* Its main application in educational settings is as a reagent in the Belousov-Zhabotinsky (B-Z) “oscillating clock” chemical reaction. Potassium bromate has not been included in the Recommended List of Chemicals as there are alternative chemicals for the “oscillating clock” reactions that use safer reagents, there are limited applications for potassium bromate and the risks associated with its use are too great.

If its use is contemplated, we strongly advise that this be subject to meeting the requirements of a **strict, local risk assessment process**, and then **only as a demonstration activity undertaken by qualified staff**. I.e., a technician or teacher with tertiary-level chemistry training and/or experience such that they understand the chemistry and hazards involved with handling the chemical. Elements for consideration in a risk assessment would be the **avoidance of any risk of human exposure to the chemical**, the availability of similar demonstrations that use safer reagents, the disposal of unused potassium bromate and any wastes generated in the activity, purchase and use in minimum quantities, short-term storage of the chemical, and the levels of qualification and experience of staff proposing to undertake the activity.

The proposed use for potassium bromate

When the question was first raised, the Science ASSIST team was particularly concerned because at that stage there was no indication of the planned purchase quantity, management, or use, and no information as to the qualifications of the person(s) conducting the activity. With the limited information provided, we would strongly advise against the use of potassium bromate in a school.

Through further correspondence, we now understand that the proposed activity is the Belousov-Zhabotinsky (B-Z) chemical oscillating (“clock”) reaction that uses relatively small quantities, and will be conducted by a trained staff member, at low temperatures and with minimal generation of vapours and using relevant Personal Protective Equipment (PPE). These factors provide some reassurance that the activity can be safely managed.

We also recommend that you consider carefully if this is a suitable activity for an open day.

Science ASSIST strongly recommends that safer alternative reactions are demonstrated.

Alternative “oscillating clock” demonstrations

Two examples of alternative oscillating reactions:

- The “Blue bottle” <https://edu.rsc.org/exhibition-chemistry/the-blue-bottle-reaction/2020070.article>
- The Briggs-Rauscher reaction <https://www.thoughtco.com/briggs-rauscher-oscillating-color-change-react...>

Potassium bromate safety information

Regarding the use of potassium bromate, it is the carcinogenic classification that raises the most serious concern for use in school science. It is listed in the World Health Organisation's International Agency for Research on Cancer (IARC) Monographs on the evaluation of carcinogenic risks to humans as Group 2B (Possibly carcinogenic to humans). It is classified as Carcinogen Category 2 on the Safe Work Australia Hazardous Substances Information System (HSIS) with the new classification of Category 1B (presumed human carcinogen based on demonstrated animal carcinogenicity) under the GHS classification system. It is very clear that any human exposure to this chemical is to be avoided.

If a school decides to use potassium bromate, it is essential that engineering controls, such as a fume cupboard is used and relevant PPE, such as safety glasses, gloves, lab coat and closed in shoes are worn when handling this chemical. Storage should be kept to minimum quantities in a properly labelled and sealed container, segregated from incompatible substances, as well as protected from sunlight and moisture in a secure chemical store. If potassium bromate is purchased, then we recommend that schools minimise the management issues by purchasing a small pack size such as 100g or smaller rather than the more common 500g chemical pack size.

Hazardous Chemicals for Demonstration Purpose Use Only

The Science ASSIST team recognises that there are some requirements for the special use of hazardous chemicals for demonstration purposes that lie outside usual student use and curriculum requirements. It is not our intent to unnecessarily restrict such activities, but to support their safe conduct.

In developing and maintaining the recommended list for schools, consideration is given to setting guidelines for such a category of chemicals. These guidelines include the following:

- The school undertakes a detailed written Risk Assessment on the management, storage and use of the chemical prior to purchase.
- The teacher who is conducting the activity must be trained in its use.
- Purchase can proceed only if the Risk Assessment indicates that there are adequate control measures for the storage, use and disposal of the chemical.
- Purchase quantity is limited to the minimum available required for the planned activity.
- After the activity, unused quantities of the chemical must be disposed of in an appropriate way, either immediately or within twelve months.

References

Baker, C. (2006, November 1) *The 'blue bottle' reaction*, Retrieved from the Royal Society of Chemistry website: <https://edu.rsc.org/exhibition-chemistry/the-blue-bottle-reaction/202007...>

Helmenstine, A-M, (2021, September 7) "*Briggs-Rauscher Oscillating Color Change Reaction*." Retrieved from the ThoughtCo, website: [thoughtco.com/briggs-rauscher-oscillating-color-change-reaction-602057](https://www.thoughtco.com/briggs-rauscher-oscillating-color-change-reaction-602057).

IARC Monographs. *Agents classified by the IARC Monographs*. <https://monographs.iarc.fr/agents-classified-by-the-iarc/> (Accessed Feb 2023)

Sigma-Aldrich. 2022. *Potassium bromate*, Safety Data Sheet. Search <https://www.sigmaaldrich.com/australia.html> to source the latest Safety Data Sheet via the product information page.