

GLOWING CRYSTALS



Instructions

Warning! — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Only for use by children 8 years of age and older. Use only under careful supervision of adults who have familiarized themselves with the kit's written safety precautions.

Caution! — Contains some chemicals categorized as hazardous to health. Read the instructions before use, follow them, and keep them on hand for reference.

Never bring the chemicals into contact with any part of your body, especially mouth and eyes.

Keep small children and animals away from the experiments.

Store the kit out of the reach of small children.

Eye protection for adults not included.

1st Edition © 2009 Franckh-Kosmos Verlags-GmbH & Co. KG, Stuttgart, Germany
This work, including all its parts, is copyright protected. Any use outside the specific limits of the copyright law is prohibited and punishable by law without the consent of the publisher. This applies specifically to reproductions, translations and microfilming and the storage and processing in electronic systems and networks. We do not guarantee that all material in this work is free from other copyright or other protection.

Text: Beatrix Kächele; Manual and packaging layout: komunik – Michael Schlegel, Würzburg; Illustrations: Andrea Mangold, Munich; Photos: pixelquelle.de: rear side (ice crystals)

First English Edition © 2010 Thames & Kosmos, LLC, Providence, RI
© Thames & Kosmos is a registered trademark of Thames & Kosmos, LLC.
Translation: David Gamon; Editing: Ted McGuire; Additional Graphics and Layout: Dan Freitas

Distributed in North America by Thames & Kosmos, LLC, Providence, RI 02903
Phone: 800-587-2872; Email: support@thamesandkosmos.com

Printed in Germany / Imprimé en Allemagne

Contents



- | | |
|--|----------------|
| 1 Bag Aluminum potassium sulfate (alum) 20 g | Wooden spatula |
| 1 Bag Aluminum potassium sulfate (alum) 50 g | Safety goggles |
| 1 Bag Glow-in-the-dark pigment (Strontium aluminate) 2 g | Treasure chest |
| 2 Measuring cups | Wooden stick |

Caution! Individual parts of this kit have pointed or sharp corners or edges. Do not injure yourself! We reserve the right to make technical changes. Before starting, check the labels to make sure that the kit has the correct chemicals (alum = aluminum potassium sulfate and glow-in-the-dark pigment = strontium aluminate).

Before starting the experiments, please be sure that all equipment and chemicals are ready. The safety goggles are particularly important!

Instructions for Using the Safety Goggles (Item No. 052347)

Use: The safety goggles are only to be used with the experiment kit. Any other type of application is not permitted. Wear the goggles in such a way that the eye area is protected. If necessary, adjust the elastic band to the child's head circumference. The safety goggles can be used with contact lenses. Wearers of corrective eyeglasses need special safety goggles for people who wear glasses.

Duration of Use: Always wear the safety goggles when performing your experiments. Not intended for long-term use. The duration of wear should not exceed the time of the experiment.

Storage: Store safety goggles at room temperature in a dry room. After the experiment, return them to their place in the kit box, to keep them from being scratched.

Cleaning: Do not clean the safety goggles when they are dry. Rinse them with clean water and, if necessary, with a mild household liquid detergent, and dry them with a soft cloth.

Maintenance: In case of defective safety goggles or scratched lenses, exchange them for an equivalently constructed pair.

Inspection: Check the safety goggles to make sure they are in good condition, and replace them if they are damaged.

Warning: Some extremely sensitive individuals may experience an allergic reaction after skin contact with some materials under some circumstances.

Replacement: These safety goggles are available as a replacement part.

The safety goggles are tested per EC guideline 89/686/EWG (personal protective equipment) and EN 166, as well as EC guideline 88/378/EWG and EN 71-4. Test center per EC guideline 89/686/EWG and EN 166 Certification Center 0196: DIN CERTO, Westliche 56, 75172 Pforzheim, Germany
Test center per EC guideline 88/378/EWG and EN 71-4 Certification Center 0197: TÜV Rheinland Product Safety GmbH, Am Grauen Stein, D-51105 Köln, Germany
Franckh-Kosmos Verlags-GmbH & Co. KG, Pfizerstraße 5-7, Stuttgart, Germany

General Instructions

Introduction for Parent and Supervisors

With the Thames & Kosmos Glowing Crystals kit, you can grow extraordinary crystals. After you grow them, you can display these glow-in-the-dark objects of wonder in a lockable treasure chest.

It is common to have questions about the safety of a chemistry kit. Improper use of chemicals can lead to injuries and other risks to health. The experimental equipment in this kit meets US and European Safety Standards, which specify the safety requirements for chemistry toys. These standards impose obligations on the manufacturer, such as forbidding the use of any particularly dangerous chemicals. The standards also stipulate that adults should assist their children with advice and assistance in their new hobby. So we are addressing this information to you, the parents and adult supervisors, so you can understand what this involves.

If the instructions and safety warnings in the instruction manual are followed, it is not dangerous to make crystals. Please read through these instructions and pay particular attention to the basic rules for safe experimentation as well as first aid in case of accidents. Several of the risks mentioned in these sections cannot occur with the experiments in this kit, since there are no corresponding experiments. Nevertheless, we are providing the complete, officially prescribed list of safety information, as would be found in the instructions for our larger chemistry kits. If your child should choose to continue experimenting in the field of chemistry, the foundation for responsible experimentation will have been laid.



Before beginning the experiments, discuss the above-mentioned safety advice and the basic rules for safe experimentation with your child. Hot water will be needed for making the crystals; you will need to lend your child a hand in preparing this.

It is important that you take appropriate fire safety precautions when heating the water on the stove. Emphasize to your child that he or she must read all the safety warnings and keep them on hand for reference, and perform only the experiments described in this manual. Provide your child with information, but don't frighten him or her — there is no reason for that. Nevertheless, contact between the alum powder and the skin should be avoided, particularly with eyes and mouth. The work area should be in an out-of-the-way place, and should not be located in the kitchen — chemicals must be kept strictly separate from foodstuffs and kitchen implements.

No containers and work equipment used for growing crystals may be used in the kitchen afterwards. Please be sure not to let alum or alum crystals get into the hands of small children.

We wish you and your children a lot of fun and perfectly grown glow-in-the-dark crystals!

Basic Rules for Safe Experimentation

Stop! Read This First, Before You Start!

Important Information for Crystal Growers

All of the experiments described in this manual can be performed safely, as long as you conscientiously follow the advice and instructions. Pay special attention to the following basic rules for chemical experiments.

1. Read the instructions before starting the experiments, follow them, and keep them on hand for reference. Pay special attention to the specified quantities and the sequence of individual steps. Only perform the experiments specified or suggested in the instructions.
2. Keep small children and animals away from the workplace, as well as anyone who is not wearing eye protection.
3. Always wear eye protection. If you wear glasses, you will need protective goggles for eyeglass wearers. When you work, wear appropriate protective clothing (old smock).
4. Store the experiment kit, alum powder, solutions, and the finished crystals out of the reach of small children.
5. Clean all containers after use.
6. Wash your hands after completing the experiments.
7. Only use equipment included with the kit or equipment that you are specifically asked to obtain for individual experiments.
8. Do not eat, drink, or smoke while experimenting. Be sure that nobody else eats, drinks, or smokes in the same room. Do not use any eating, drinking, or other kitchen utensils for your experiments, unless they are specifically recommended.
9. Do not bring any chemicals into contact with your eyes or mouth.
10. Label any filled containers that have to stand for a while (e.g. for materials to crystallize), and keep them inaccessible to small children and animals.

First Aid Advice

Most importantly, in case of injury, seek immediate medical help.

1. In case of contact with the eyes: Rinse eye with plenty of water, holding the eye open if necessary. Rinse from the nose outward. Seek immediate medical help.
2. In case of swallowing: Rinse out the mouth with water, and then drink fresh water. Do not induce vomiting. Seek immediate medical help.
3. In case of inhalation: Bring the person into fresh air (e.g. into another room with open windows).
4. In case of contact with the skin or in case of burns: Rinse off the affected area of skin for five minutes with lots of water. Then cover burns with a bandage. Never apply oil, powder, or flour to the wound. Do not lance blisters. For larger burns, seek immediate medical help.
5. In case of cuts: Do not touch or rinse with water. Do not apply any ointments, powders, or the like. Dress the wound with a germ-free, dry first-aid bandage. Foreign objects (e.g. glass splinters) should only be removed from the wound by a doctor. Seek the advice of a doctor if you feel a sharp or throbbing pain.

Should the symptoms persist, seek medical help without delay. With accidents involving chemicals, always take the chemical with its container to the doctor or tell the doctor the name of the chemical.

In case of emergency, contact the **National Poison Control Center** at:

1-800-222-1222



Advice for Experimentation

Safety

Safety is the most important thing. Do not bring the materials you're handling into contact with your body, particularly with your eyes or mouth. Be especially careful with hot burners and don't forget to turn off the stove after you are done.

Caution! Keep all chemicals locked up and out of the reach of children.

This means, above all, small children, but it also refers to older children — ones who are not performing the experiments — who have not been specifically instructed by parents. In addition, obey safety measures these safety measures:

- Do not breathe in chemical powder or dust.
- Avoid contact with eyes and mouth (if any alum gets onto your skin, rinse it off immediately under running water)
- If swallowed, seek immediate medical advice and show container or label.

Cleaning and Disposal

Cleanliness is just as important in chemistry as in the kitchen. Always clean the containers you have used and your work area immediately following your experiments. Fresh dirt is easier to clean off than caked-on dirt! Rinse the containers thoroughly with clean water and dry it with a paper towel, which you should then throw away in the trash. Since you will only be working with small amounts of chemicals in these experiments, you can simply rinse liquid waste down the drain with plenty of water and throw solid waste into the household garbage.

i Tip:

Cut open the chemical bags at one corner with a pair of scissors — never open it with your teeth. When you cut it open, be sure the label remains readable.

Important: All filled containers should be labeled with a label indicating its contents.

Let's Get Started!

01 Experiment

Creating Your First Glow-In-The-Dark Crystal

Material from the kit: Safety goggles, alum (20 g bag), glow-in-the-dark pigment (in bag), measuring cup, wooden spatula

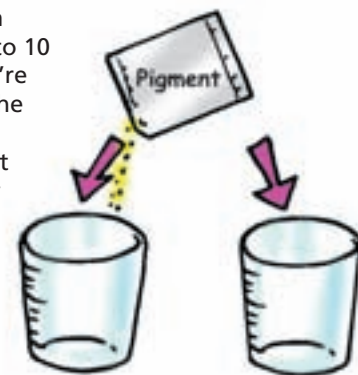
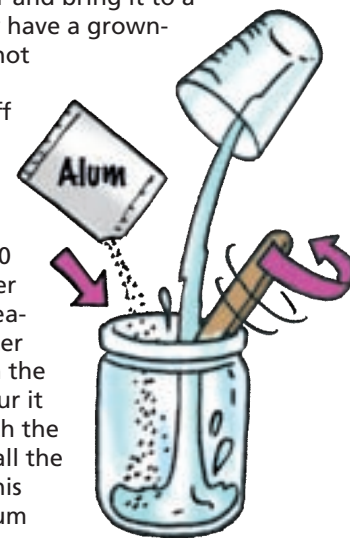
You will also need: Cooking pot, old jelly jar, thermos, paper towel, old newspaper, old spoon

1 First put on the safety goggles. Spread a layer of newspaper over your work area to protect it.

2 Fill a pot with water and bring it to a boil on the stove. Now have a grown-up help you pour the hot water into a thermos. Don't forget to turn off the stove afterwards!

3 Cut open the smaller bag of alum (20 g) and pour the powder into an old jelly jar. Measure 100 ml of hot water from the thermos with the measuring cup and pour it onto the alum. Stir with the wooden spatula until all the powder is dissolved. This liquid will be called alum solution.

4 Let this hot alum solution cool for 5 to 10 minutes. While you're waiting, cut open the bag with the glow-in-the-dark pigment and divide it evenly between the two measuring cups.



5 Then pour 50 ml of the alum solution into each of the cups of pigment and stir well with the wooden spatula.

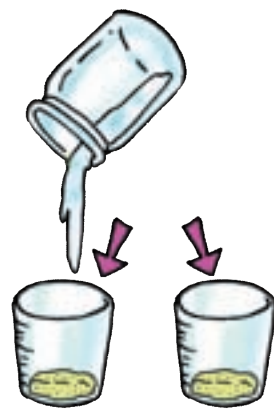
6 Place the cups in a quiet location where they won't be disturbed. Now you will have to take a long break from your work — but feel free

to take a look into the cups now and then. You will see how jagged shapes start to form on the sides and bottom of the cups, which grow larger as time passes. Those are your first crystals.



7 Ideally, let the cups sit overnight. Then remove the crystals from the solution with an old spoon and place them on a sheet of paper towel doubled over on itself. Don't be surprised if there is still glow-in-the-dark pigment on the bottom of the cup — there will still be enough in the crystal to make it glow. Take the dried crystals carefully between your thumb and forefinger and put them in your lockable treasure chest. Don't forget to wash your hands afterwards.

8 If you shine light on these crystals for a while and then look at them in the dark, you will see them shine with a greenish-yellow glow.



02 Experiment

The Single Glow-In-The-Dark Crystal

The crystals that you've made up to now are all pretty small. With a little patience, you can use a second production step to create a single large glow-in-the-dark crystal.

Material from the kit: Safety goggles, alum (50 g bag), measuring cup, wooden spatula, wooden stick

You will also need: Pot, old glass jelly jar, thermos, paper towel, old newspaper, old spoon, thin sewing thread

1 Put on your safety goggles again and spread a layer of newspaper over your work area to protect it.

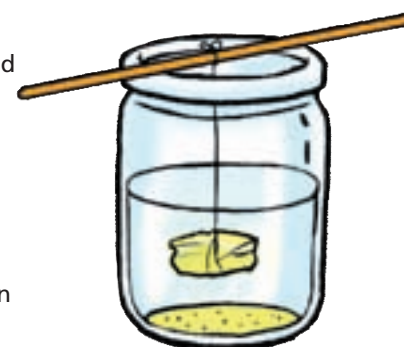
2 Fill a pot with water and bring it to a boil on the stove. Now have a grown-up help you pour the hot water into a thermos. Don't forget to turn off the stove afterwards!

3 Cut open the bag with the alum and pour the contents into an old glass jelly jar.

4 Measure 200 ml of hot water from the thermos with the measuring cup, pour it onto the alum, and stir with the wooden spatula until everything is dissolved.

5 Let the solution cool until it is lukewarm. While waiting, find a particularly nice-looking crystal from your collection and secure it carefully to a piece of thin sewing thread. Ideally, tie it on with a loop. If it doesn't work or if it doesn't hold well, you can use a little glue to help secure it.

6 Tie the thread securely to the wooden stick. Lay the stick across the jelly jar holding the alum solution, so the crystal dangles freely in the solution.



7 Now set the jar in a quiet spot and cover it with a paper towel.

8 Watch how your crystal continues to grow. Ideally, pull your crystal out of the solution every day and dissolve the crystals that are accumulating on the bottom of the jar. You can use a water bath for this, as described below.

9 In this way, as time passes your glowing crystal will grow to stately proportions. It is up to you to decide how long you want to continue this process. When you are pleased with the result, add the crystal to the others in your treasure chest and carefully lock it with the screw.

Water Bath Instructions

You can use a water bath to loosen the alum: Fill an old pot with about 3 cm of tap water, and bring the water to a boil on the stove. Have a grown-up help you with this. Don't forget to turn the stove off afterwards, and be careful not to burn yourself on the hot stove. Set the pot on a trivet or hot pad. Place the jelly jar in the pot and stir the alum solution to dissolve the crystals.

DID YOU KNOW?

How Crystals Are Formed and Why Your Crystals Glow

When you dissolved the alum in the hot water, you created a "saturated solution." That means that the water had as much alum as possible dissolved in it. When it cools, not all the particles remain dissolved, but instead they organize themselves into a regular structure. In the process, the glow-in-the-dark pigment becomes embedded in this crystal structure (which is called a crystal lattice).

The secret to the glow is a chemical substance that has a special property, called phosphorescence. That means that it absorbs light and stores the light's energy. And then it radiates this light energy out again — which is, of course, particularly easy to see in the dark. Set your crystals under a lamp or in the sunlight. After a minute or two, darken the room. You will see that the crystals have a greenish-yellow shimmer!

Important Fact About Crystals

You can find crystals all around you.

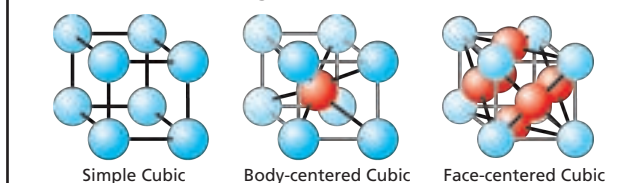
The salt that you eat on your morning breakfast egg consists of crystals, as does the sugar that we use for baking. In the winter, you may marvel over ice and snow crystals outside, and you must certainly have also seen valuable colored crystals — gemstones — in pieces of jewelry.



The first discoveries of large, beautifully formed crystals must certainly have happened by accident. Even in the Stone Age, over 10,000 years ago, people found remarkable stones every once in a while. They were different from other stones — they sparkled, reflected light in unusual ways, and had special colors. People couldn't explain where these remarkable stones came from. So crystals were regarded as something magical and mysterious. Mysteries, healing powers, magic, luck and misfortune were all attributed to crystals.

Crystals have a geometrically ordered shape that is otherwise unusual in nature. The crystal shapes form when dissolved substances gradually become solid again. They can be octahedrons, cubes, or needles. The shape that occurs depends on the kind of substance involved.

Crystals form because the atoms inside them naturally stack themselves up in ordered ways. The three most common arrangements of atoms are:



If you are interested in the formation of crystals and you want to grow more of them, you can easily do so with other experiment kits by Thames & Kosmos, such as Crystals, Rocks & Minerals.