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Preparation of Contact Explosives

This is part of a series of files on pyrotechnics and explosives. It's serious stuff, and can be really dangerous if you don't treat it seriously. For you kids out there who watch too many cartoons, remember that if a part of your body gets blown away in the REAL world, it STAYS blown away. If you can't treat this stuff with respect, don't screw around with it.

Each file will start with a set of safety rules. Don't skip over them. Read 'em and MEMORIZE 'em!! At the beginning, there will be a set of general rules that always apply. Then there will be some things that you HAVE TO KNOW about the materials you will be using and making this time. Read it thoroughly before starting anything.

Pyrotechnic preparations and explosives are, by their very nature, unstable, and subject to ignition by explosion or heat, shock, or friction. A clear understanding of their dangerous properties and due care in the handling of ingredients or finished products is necessary if accidents are to be avoided. Always observe all possible precautions, particularly the following:

1. Mix only small batches at one time. This means a few grams, or at most, an ounce or so. Don't go for big mixes -- they only make for bigger accidents. The power of an explosive cubes itself with every ounce. (9 Ounces is 729 times as powerful as one ounce.)
2. When weighing chemicals, use a clean piece of paper on the scale pan for each item. Then discard the used paper into a bucket of water before weighing the next ingredient.
3. Be a safe worker. Dispose of any chemicals spilled on the workbench or equipment between weighings. Don't keep open containers of chemicals on your table, since accidental spillage or mixing may occur. When finished with a container, close it, and replace it on the storage shelf. Use only clean equipment.
4. Where chemicals are to be ground, grind them separately, NEVER TOGETHER. Thoroughly wash and clean equipment before grinding another ingredient.
5. Mixing of batches should be done outdoors, away from flammable structures, such as buildings, barns, garages, etc. Mixes should also be made in NON METALLIC containers to avoid sparks. Glass also should not be used since it will shatter in case of an accident. Handy small containers can be made by cutting off the top of a plastic bottle three or four inches from the bottom. Some mixes may most conveniently be made by placing the ingredients in a plastic bottle and rolling around until the mixture is uniform.

BOMB15.TXT

In all cases, point the open end of the container away from yourself. Never hold your body or face over the container. Any stirring should be done with a wooden paddle or stick to avoid sparks or static.

Powdered or ground materials may also be mixed by placing them on a large sheet of paper on a flat surface and then rolling them across the sheet by lifting the sides and corners one at a time.

6. Never ram or tamp mixes into paper or cardboard tubes. Pour the material in and gently tap or shake the tube to settle the contents down.
7. Store ingredients and finished mixes where they will not be a fire hazard away from heat and flame. Finished preparations may be stored in plastic bottles which will not shatter in case of an accident. Since many of the ingredients and mixes are poisonous, they should be stored out of reach of children or pets, preferably locked away.
8. Be sure threads of screw top containers and caps are thoroughly cleaned. This applies also to containers with stoppers of rubber or cork and to all other types of closures. Traces of mixture caught between the container and closure may be ignited by the friction of opening or closing the container. Throughout any procedure, WORK WITH CLEAN CONDITIONS.
9. ALWAYS WEAR A FACE SHIELD OR AT LEAST SHATTERPROOF SAFETY GLASSES. Any careful worker does when handling dangerous materials. Be sure lenses and frames are not flammable.
10. Always wear a dust respirator when handling chemicals in dust form. These small particles gather in your lungs and stay there. They may cause serious illnesses later on in life.
11. Always wear gloves when working with chemicals.
12. Always wear a waterproof lab apron.
13. If you must work indoors, have a good ventilation system.
14. Never smoke anywhere near where you are working.
15. Make sure there are NO open flames present, and NO MOTORS (they produce sparks inside.) No hot water heaters, furnaces, or pilot lights in stoves!! Sparks have been known to very readily explode dust floating in the air.

BOMB15.TXT

16. ALWAYS work with someone. Two heads are better than one.
17. Have a source of water READILY available. (Fire extinguisher, hose, etc.)
18. Never, under any circumstances, use any metal to load chemicals or put chemicals in. Fireworks with metal casings are worse to handle than a live hand grenade. Never use any metal container or can. This includes the very dangerous CO₂ cartridges. Many people have been KILLED because of flying fragments from metal casings. Again, please do not use metal in any circumstance.
19. Always be thoroughly familiar with the chemicals you are using. Some information will be included in each file, but look for whatever extra information you can. Materials that were once thought to be safe can later be found out to be dangerous stuff.
20. Wash your hands and face thoroughly after using chemicals. Don't forget to wash your EARS AND YOUR NOSE.
21. If any device you've built fails to work, leave it alone. After a half hour or so, you may try to bury it, but never try to unload or reuse any dud.
22. If dust particles start to form in the air, stop what you are doing and leave until it settles.
23. Read the entire file before trying to do anything.
24. NEVER strike any mixture containing Chlorates, Nitrates, Perchlorates, Permanganates, Bichromates, or powdered metals don't drop them, or even handle them roughly.

These rules may all look like a lot of silly nonsense, but let's look at one example. When the movie "The Wizard of OZ" was made, the actress who played the good witch was severely burned when one of the exploding special effects got out of hand. The actress who played the bad witch got really messed up by the green coloring used on her face, and the original actor who played the Tin Man got his lungs destroyed by the aluminum dust used to color his face. The actor we know of as the tin man was actually a replacement. The point is, these chemicals were being used under the direction of people a lot more knowlegable of chemicals than you are, and terrible accidents still happened. Don't take this stuff lightly.

The contact explosives we will be describing use only a few chemicals. Some do need extra caution to keep from causing trouble.

BOMB15.TXT

Iodine Crystals

Though most people don't realize it, Iodine is not a brown liquid, but a steel-grey solid. The tincture of iodine you buy at the drugstore actually contains just a tiny bit of iodine dissolved in a jarful of inexpensive alcohol, and resold at a huge mark up. We'll be using iodine in the crystalline form. On contact with your skin, it will produce a dark stain that won't wash off with soap and water. We'll talk about removing these stains later. If it gets hot, it vaporizes into a purple cloud, that smells like the chlorine in a swimming pool. This cloud is dangerous to inhale, since it will condense in your lungs, and is corrosive. Since we won't need to heat this stuff, it is not a problem, but you should make sure that you don't let any iodine crystals spill onto a hot surface. If you don't touch it and keep it away from your face, you shouldn't have any troubles.

Ammonium Hydroxide

This is just good old household ammonia. Be sure to get the clear kind. The sudsy stuff won't be too useful. It is made from ammonia gas dissolved in water, and every time you open the bottle, it loses some of its strength, so be sure to use fresh stuff. We need it to be as strong as possible. Some of the formulas given here use lab grade concentrated ammonium hydroxide. It is much stronger than the supermarket kind, and is very unkind to skin or especially the eyes. It is a good idea to wear eye protection with even the supermarket grade. Though we don't usually worry about this when using household ammonia for cleaning, we usually dilute it for that. Here we'll be using it straight out of the bottle, and it is much more corrosive in that form. Never use this material if you don't have real good ventilation, as the ammonia vapors can be overpowering.

Potassium Iodide

This is a reasonably safe chemical. You get Potassium ions in some of the fruit you eat, and Iodide ions (usually as Sodium Iodide) are added to the table salt you buy at the store. So, while you don't directly eat this chemical, you do eat the components that make it up. Don't be scared of this stuff.

Sodium Thiosulfate

Otherwise known as photographic hypo. When dissolved in water, this will remove the iodine stains left by touching iodine crystals, and exploding contact explosive. Not particularly nasty stuff, but make sure to wash it off after cleaning yourself with it.

General Information

This is a powerful and highly sensitive explosive. A dust sized particle will

BOMB15.TXT

make a sharp crack or popping sound. A piece the size of a pencil lead will produce an explosion as loud as any of the largest firecrackers or cherry bombs. It cannot be exploded by any means when wet, and therefore can be handled and applied with safety. When dry, it will explode with the touch of a feather, or a breath of air.

The strength of the ammonia water you use will have a direct effect on the strength of the final product. If you use supermarket ammonia, the explosive will work, but not as spectacularly as if you use a 15% or higher (10 to 15 molar) solution. The stronger it is, the better. You'll also need filter paper, and a funnel. A properly folded coffee filter will do nicely if you don't have the filter paper. If you're not sure how to fold filter paper, check an elementary chemistry textbook.

Methods of Preparation

1.) Granular Explosive. This is the easiest kind, and the only kind that will work reasonably well with supermarket ammonia. Crush enough iodine crystals to make a pile of powder equal to the volume of a pencil eraser. Do not grind into a fine powder. Put about 4 ounces or 1/2 measuring cup of strong ammonia water into a small container with the iodine, and seal it for about 5 to 10 minutes, shaking frequently. While the mixture is reacting, get your filter paper ready. While it is best to consult a book that shows how to do this, you take the circle of filter paper, fold it in half, fold it again at right angles to the first fold, and then open it to form a cone. Open or close it as needed to make it conform to the angle of the funnel, and moisten it a little to make it stick in place. Place the funnel over a container that will catch the waste liquid. Let the mixture settle long enough for the sediment to settle, and pour off as much of the clear liquid as possible before filtering the sediment. Pour the remaining liquid and sediment into the filter. The sediment (and the filter paper covered with it!!!) is your explosive. The small amount you have made will go a lot farther than you realize. Particularly if you used good strong ammonia. Place the explosive in an airtight leakproof pill bottle. As this explosive is unstable by nature, fresh amounts give better results than stale ones that have been sitting around for a day or so. Best results are obtained with small fresh batches. But as you'll see, there are a few tricks you can do with this material that do require it to sit for a day or more.

The explosive should be stored and applied while wet.

2.) Paint type explosive. This will use up a lot of iodine crystals. Make up a strong tincture of iodine using about 4 ounces or 1/2 measuring cup of rubbing alcohol, denatured alcohol, or wood alcohol. Wood alcohol is preferable. Add iodine crystals and shake thoroughly until no more will dissolve. Pour the liquid into a fruit jar. Add the ammonium hydroxide and stir the mixture until the mixture is a chocolate brown and shows a little of the original color of the iodine. The amount of ammonia necessary will depend on its strength. An equal volume of ammonia is usually sufficient for a 15% or higher solution. The

BOMB15.TXT

solution should be filtered at once, and shouldn't ever wait more than 10 or 15 minutes, because it starts to dissolve again.

The explosive again should be stored and applied while wet. This material is chemically the same as the granular explosive, but because it was precipitated from a solution, it is much more finely divided, and the reaction happens almost simultaneously, so you can get it out before it all vanishes back into the solution.

3.) Paint type #2. Dissolve 1 gram of potassium iodide in about 90cc of 18%-22% ammonium hydroxide. Add 4 grams of pulverized iodine. A deep black sediment should start forming. Let stand, and stir frequently for five minutes. Then, filter as usual. While the potassium iodide is not an integral part of the chemical reaction, the dissolved potassium iodide will allow the iodine crystals in turn to dissolve, and its common ion effect will cause less iodine crystals to be wasted. Since the iodine is by far the most expensive ingredient, you'll save money in the long run by using it.

Care in Handling And Storage

Because this material is so unstable it deteriorates quickly. Don't make any more than you need to use in the next 24 hours. If you can't use it all immediately, the container you keep it in should be recapped tightly after use and the mouth wiped clean. The explosive can cause dark stain damage to things as rugs, clothing, chair seats, wallpaper, and light or clear plastics. A strong solution of sodium thiosulfate is effective for removing stains from hands and clothing before they set. Never leave the container of explosive in direct sunlight for more than a few minutes, as it will weaken the strength. Do NOT attempt to make a large explosion as it is dangerous and can cause deafness. All equipment used should be thoroughly washed and the used filter paper flushed down the toilet. Under no circumstances attempt to handle the dried material which is extremely explosive and hazardous. If you can avoid storing the material in a container at all, there will be no chance that a loose stopper will let the material dry out and become a potential bomb. Tiny bits of this can be great fun, but it has to be handled with care.

Application

Although largely a scientific curiosity, this explosive finds itself well suited for practical jokes. It may easily be painted on the bottom side of light switches, sprinkled on floors, painted in keyholes, pencil sharpeners, doorknobs and in hundreds of other unsuspected places. It is also ideal for catching locker thieves and desk prowlers. It will leave a dark stain on his hands when it explodes, and only you will know how to remove it.

Reaction Equations

Ammonium

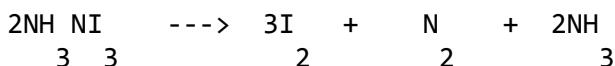
BOMB15.TXT

Ammonium Ammonium Nitrogen
Iodine Hydroxide Iodide Tri Iodide Water



The theoretical yield of explosive from pure iodine is 54.1% by weight. The remainder of the iodine may be recovered for reuse from the ammonium iodide waste product by evaporating the waste liquid and treating with chlorine if a chemistry lab is available. The contact explosive is Ammonium Nitrogen Tri-Iodide, which explodes into iodine, nitrogen, and ammonia.

Ammonium
Nitrogen
Tri-Iodide Iodine Nitrogen Ammonia



Some Clever Uses For This Material

1.) Contact Explosive Torpedos. Get some gelatin capsules, the kind pills are made of. Fill the small half with uncooked dry tapioca until it is half full. Then place a wet blob of contact explosive about 4 times the size of a straight pin head on top of it. Either the granular or paint type explosive will work. The capsule is then filled the rest of the way up with tapioca until, when the capsule is put together, the grains of tapioca are packed tightly, and none are loose. If this is not done properly, the torpedos could go off prematurely, and the joke would be on you. The torpedos are then moistened at the joints to seal them and stored until the next day. They are not sensitive enough until the next day and too sensitive the day after, so plan your activities accordingly. These torpedos are the most fiendish devices made. You can lay one on top of a door, where it will roll off when the door is opened, and it will explode on contact with the floor. If you toss one some distance away it will appear as if someone else was responsible for the explosion. These torpedos are ideal as booby traps or for pulling practical jokes with. They may be carried in a small box filled with cotton until needed. Just treat the box gently, and all will be well.

2. Contact Explosive Booby Traps. Prepare a small amount of contact explosive. Cut strips of newspaper 1 1/2 inches wide and 1 foot long. Cut a piece of string 1 foot long. Put a small amount of wet contact explosive on the strip of paper 1 inch from the end. Double the string. Now pull one end of the string back until there is a double loop in the string about 1 inch long. Do not tie. Lay this double loop across the wet contact explosive and tightly roll the paper and glue the end. Put away for a few days until thoroughly dry. When dry, pull the ends of the string and the booby trap will explode. The strings, when pulled, rub against the dry contact explosive, and make it explode.

Getting The Materials

There are quite a few chemical supply houses that you can mail order the materials you need. You'll have to sign a form stating that you're over 21 and won't use the chemicals for the types of things we're learning here. Note that the people who run these supply houses know what Iodine Crystals and Ammonium Hydroxide can do when mixed together, and if you order both from the same place, or in the same order, it may arouse some suspicion.

Check the classified ads in the back of magazines like Popular Science for the current supply houses. Order as many catalogs as you can find. Not all sell every chemical that you may want for this series. Also, you can break the orders up so as not to look suspicious. Lastly, some houses are used to selling to individuals, and will provide chemicals in 1 or 4 ounce lots, while others prefer to sell to large institutions, and sell their wares in 1 or 5 pound jugs. Split up your orders according to the quantities of each item you think you will be needing. An ounce of Iodine Crystals will cost three or four dollars an ounce, and an ounce bottle of iodine is pretty tiny, but it goes a long way. If you had to buy that by the pound, you might just want to forget the whole thing.

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