WARNING AND DISCLAIMER: If you are underage, then consult with your parents or guardians before attempting any of this. You are on your own - I'm not responsible for your actions or harm you may bring to others because of your actions. Making the items described below can result in injury or death to you or people in your vicinity. Some things mentioned here may be illegal to make in your city, county, state, or country so check the laws that apply to you before you attempt anything described here. These notes are not complete on purpose. If you are reading them and new to pyrotechnics, then you are making a mistake. Stop now - this page is not for you. Get a beginning book on fireworks (see Skylighter or American Fireworks News (very quick shipping) for a start) and read up. You can't make any of this work without more information so read up or join a club or ask someone to help you.

Compositions - The Abbreviated Version

This list of compositions is not meant to be exhaustive. It is just a list of ones that I have used or with which I'm currently experimenting

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Black powder - see blackpowder2.html

Be sure to read about charcoal as a variable - it is a short read but pretty

important. Your choice of charcoal will affect the outcome of most of the formulas below. Use Skylighter Airfloat Charcoal and a rock tumbler for milling if you want to duplicate my results. If you use a heavier duty pyro mill, your BP will be hotter by far and will probably require taming down quite a bit.

BenzoLift

BenzoLift is essentially whistle mix that is diluted with black powder. If made correctly, Benzolift can be very powerful. Be careful - it can be two or more times as powerful as commercial BP and seems to be the answer to the weaknesses of homemade BP - that is, the stuff is powerful enough that you don't have to make charcoal from hard-to-get woods to make a good lift powder. Normal BP made from Skylighter airfloat charcoal makes great Benzolift (about twice as strong as Elephant brand 2fg). In addition, it doesn't take too long to make and it is cheaper than commercial BP. It might be a bit more expensive than homemade BP although that might not be true when you factor in the efficiencies of using it.

Here is a link to how to make simple Benzolift safely: benzolift.html. If you decide to make it, then stay consistent on your process from batch to batch - minor changes in process can affect the power of Benzolift quite a lot.

There is probably no reason to use Benzolift for lifting large shells - Benzolift is in the 3" and less territory! One thing I have noticed - it 'slams' the shell harder than BP does. Specifically, a 3 gram charge of Benzolift in a Double-Voice Cracker will destroy the cracker on the ground - 3 grams of very hot BP will lift it into the air the way it is supposed to. Both these charges, when used in a mortar, lift the shell about the same height.

Since it is much easier to make Benzolift than hot BP (especially if one can't get/make the correct charcoals), here are some small diameter rules of thumb for lift quantities that I go by (your mileage and cardboard shrapnel may vary):

1.5 to 1.75" - 2 grams of Benzolift
2" - 2.5 grams to 3 grams
3" - 5 grams

Over 3" - don't use Benzolift - use BP. Even poor lift powder can often be used for larger mortars.

Rocket Fuels

RP (BP) is 'Rocket Propellant' which is a 18 Potassium Nitrate, 6 Skylighter airfloat charcoal, 3 Sulphur, 2 Aluminum dust (atomized or use titanium flake - very sparky!) mix. That makes it about 62% oxidizer. It was described by Alan Yates. Ball mill all except aluminum for 24 hours if using a rock tumbler - 3 hrs if using a hobby pyro mill.. Mix in aluminum. Moisten. Press through a coarse screen. Dry. This mixture seems a bit tame but it is safe to use on almost anything. Start with it and work your way hotter.

RPH (BP) is 'Rocket Propellant Hotter' which is 68 Potassium Nitrate, 17 Skylighter airfloat charcoal, 10 Sulphur, 5 Aluminum dust (atomized) and riced using the same method as RP (see RP above). Used for rockets up to 1/2". 1/2" rockets must have a large nozzle (> 1/3 ID) and the spindle should not be longer than about 2 1/2" if you use this mixture.

Nozzleless Fuel (BP) is very hot fuel used for nozzleless rockets. Use 75/15/10 willow based BP or similar that has been ball milled in a pyro ball mill for at least 3.5 hours. Mix +3% mineral oil with lacquer thinner (about 1 part mineral oil to about 10 parts lacquer thinner) and then mix that with the BP and dry for 24 hours. Alternatively, and probably better, just mill in the 3% oil during the last 15 minutes of mill time. The BP is not granulated or made to pulverone, rather it is used as it comes from the ball mill. The mineral oil keeps the dust down and makes the BP soft and easily compacted. Hard grained BPs will often CATO because it is so difficult to eliminate the tiny faults in the compressed grain. Try using 2Fa as a nozzleless fuel sometime -- but make sure you retire sufficiently away from the rocket because it will pop. I've pressed 2Fa grains to 8000 pounds and they still had faults in them.

Red Magnalium Chuffer Rocket

3/4" (One pound) Red Mag Rocket on Takeoff

Source: Doc Barr/Dave Stoddard/John Steinberg (Skylighter newsletter)
See also: Magnalium Rockets

Strontium Nitrate	55 %
Magnalium, -325 mesh powder	28 %
PVC powder	10 %
Parlon	7 %
Vaseline (dissolved in Naphtha)	+2 %

Note: Doc Barr was the pioneer on this, Stoddard and Steinberg continued his experiments. While Stoddard's instructions state that the composition must be slightly damp to chuff, I've found that it will chuff even when dried thoroughly - the Naphtha seems to make it chuff. If no Naphtha is used, it seems to chuff much less. I used a standard BP rocket spindle for these and

fused them with fast Visco that had the tip dipped in NC lacquer and a bit of titanium. The reason for the hot fuse is that normal Visco (especially American) will not ignite the core reliably. Another alternative is to press about 1/3 increment of whistle just above the nozzle. That always ignites them. The composition was pressed to about 3500 on the mix. It is important to use the same size magnalium each time. Different sizes affect both power and chuffing.

I used mineral oil instead of Vaseline.

Video: http://www.wichitabuggywhip.com/fireworks/strontium.wmv

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Green Magnalium Rocket

Source: Dave Stoddard (Skylighter newsletter)
See also: Magnalium Rockets

Barium Nitrate	60 %
Magnalium, -325 mesh powder	25 %
PVC powder	9 %
Parlon	6 %

Makes fast stars, too. Use lacquer thinner to wet, cut them. Prime with a good prime!

Yellow Magnalium Rocket

Source: Dave Stoddard (Skylighter newsletter)
This isn't a very spectacular rocket. It looks a lot like a BP version - probably not worth the effort
See also: Magnalium Rockets

Strontium Nitrate	22%
Barium Nitrate	36 %
Magnalium, -325 mesh powder	26.2 %
PVC powder	9.4 %
Parlon	6.4 %

1 lb rocket formula from Andy H. on rec.pyro

This is the formula I use for 1-lb rockets:

62 - KNO3
10 - Sulfur
15 - AF Charcoal (commercial)
2 - Dextrin
8 - 40-60 mesh pine
3 - Ball milled Kingsford (long-hanging sparks)

Mill together the nitrate, sulfur, air-float charcoal and dextrin together for 3 hrs. Screen in the additional charcoal, dampen, and granulate through a 20 mesh screen.

Sourball XY (sugar candy fuel). Author: Bob Forward

printed with permission

Potassium Nitrate 54
Xylitol 27
Vitamin C 8 (editor's note: ascorbic acid)
Sulfur 7
Iron(III) Oxide, red 4

WARNING: Xylitol is harmless for humans but dangerous for dogs. Because it is sweet, they will eat any residue left around. Be sure to clean up thoroughly if you have pets.

All ingredients should be milled together until fine and then melted and cast. The Xylitol melts at a low temperature; a cheap crock pot set on High is ideal.

Mixture is somewhat hygroscopic and should be allowed to cool overnight to harden. Keep in a sealed plastic bag until used.

Whistles

See whistletests.html for a full discussion of whistle fuel

Strobes

Strobe Mix from Kent Z.

I screen the following together a couple of times and then add 15% nitrocellulose with a little acetone to thin it out a little. I only get the mix wet enough to rice it thru a screen about the size of window screen. Spread out to dry.
My tooling is strobe tooling from Rich Wolter. I press about 1 3/4" of whistle before I press the strobe mix. I press both at about 6000 force pounds or 2000 psi on my hyd cylinder.

60 parts Ammonium Perchlorate 90 micron super fines from Firefox
15 parts Mag/Alum -325 mesh
10 parts Mag/Alum -200 mesh
15 parts Barium Sulfate
5 parts Pot Dichromate

Since I'm not using straight MAG I don't think you need the Pot Dichromate but my old formula called for Mag and I replaced it with Mag/Alum and never removed the Pot Dichromate and it seems to still work.

Strobe Mix from Ned G.

Making my strobe fuel is pretty simple. I use fine AP, 90 micron/down (about 200 mesh) and I've never noticed it or the Ba sulfate appearing damp. If I did, I'd dry them individually in a 220 degree oven.

The formula is:
.60 AP
.25 MgAl (200 mesh, which has some finer stuff)
.15 barium sulfate
+.05 pot dichromate
+.02 mineral oil

I simply mix the dry ingredients well, mix the mineral oil in enough Coleman fuel to get the mix good and damp, wet the fuel integrating the moisture well into the dry ingredients, and dry in a SS Pot in a larger SS pot filled with hot water (the McMurray method of drying).
The fuel will end up being like grayish/greenish sand, and consolidates rock hard when pressed.

The quality/type of the chems can make a big difference in this fuel. I just had to get some new Ba Sulfate, and I'll be interested in seeing if my next batch performs the same as the batches made with my old Ba sulfate...

BTW,
the dimensions of the spindle I'm using for my 2# strobes is:
3 3/8" long
7/16" bottom
5/16" top

I press whistle halfway up it, then strobe to above the top of it 1/4", then a half inch of whistle or red fuel, then a half inch clay bulkhead.

Blue strobe rocket propellant
Source: Greg Gallacci <psygreg@u.washington.edu
Comments: The GE silicone II is noted for having an ammonia-like odor, where the GE silicones smell more like vinegar. The dimensions of the rocket made with this propellant were 1 1/8 inch ID, with a 1/2 inch core.
Preparation: Mix the copper oxide, PVC and silicone first, in a plastic bag. Then mix in the ammonium perchlorate. The stuff is said to be somewhat crumbly, and presses well.

Ammonium perchlorate.....63
Silicone II.....22
Copper(II)oxide.....10
PVC.....5

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White strobe rocket propellant
Source: John Steinberg
Comments: Mix with NC and Acetone until it is blendable (1 kilo of comp and 4 to 5 ounces of NC binder). Dry until screenable then screen and dry overnight. Metals can be mixes of MgAl and Mg. Generally, the finer the MgAl or more fine Mg the faster the strobing. Try 300 mesh MgAl alone first to see results. If you don't have the finer MgAl or Mg then you will need to ball mill - this is a whole other safety issue and you should not do so without consulting with those who have done it. 20% MgAl (300 mesh) and

5% Mg (400 mesh atomized) causes the strobe to speed up until it is almost too fast. To press in a rocket, put in whistle mix until the spindle has less than 1 increment left to cover it. Cover it with strobe mix. Add more whistle or other things. This strobe mix is slow burning and won't provide a lot of lift so get the rocket off the ground with whistle or BP.

60% Ammonium Perchlorate

25% Metal (see above)

15% Barium Sulfate

5% additional, by weight, Potassium Dichromate

Nitrocellulose as a binder

Note: More on this strobe mix is posted later

Nitrocellulose Lacquer Substitutes.

NC Lacquer is quite expensive for what you get. You can purchase it in liquid form from some suppliers but it is usually much cheaper to buy the powdered form and mix it with acetone. Make a 25% solution by weight and then, from that, make a 10% working solution for your needs.

One good substitute is to buy a couple of six packs of Ping Pong balls and dissolve them in a 1/2 pint of acetone. The resulting white mixture is a suitable substitute for NC and it is much cheaper. I use a small paint can (a new one) and store the mixture in it when I'm done. If the liquid isn't thick enough - let it dry with the lid off for just a while (keep watch - it dries fast). If it is too thick, add a bit of acetone. Some have complained that this solution isn't flammable enough - although I've certainly had no problems with it. It is definitely slower than real NC lacquer but it works fine. Ping pong balls are not NC but are celluloid or plastic - don't use the plastic ones. The right ping pong balls - the celluloid ones - will burn when lit with a match.

Another substitute is to buy some smokeless rifle powder and dissolve it in acetone. Smokeless powder is fairly pure nitrocellulose so you are dealing with the real McCoy when you use it. Be careful. I use both single base (pure NC) or double base (NC and nitroglycerine bound together). There is some argument that the double base can, under some very specific and unusual circumstances, separate out. Just keep the mix tightly sealed and in a normal environment and you will be OK. Using acetone, make a thick mixture for your stock solution and then dilute it for your different needs. Typically, 10% is the working solution.

Finally, some hobby chemical dealers sell NC powder. Buy that and mix your own NC Lacquer. It will be much, much cheaper than the liquid version.

Priming Liquid for Fuses. A good priming liquid is made from the Ping Pong ball mixture (above) and about 1/2 BP. Use a film can for a container and mix thoroughly. Dip fuses in it followed by dipping the fuses in some loose meal. This will give you a great priming medium - it will light the first time and every time. For added benefit, add 10% titanium powder to the meal before dipping. Once dry, it will light even the hardest to light rockets.

Star Compositions

Many of these are primed heavily (just to be sure). BP and 10% Al outer, 75/25 for the next layer, 25/75 for the third. I mentioned Veline's prime before but I don't like it - it

has many ingredients and it doesn't light the stars much better than a simple green meal mix (unmilled BP with hot charcoal - 75/15/10) +10 silicon, +10 dextrin.

RED

Click on the above picture to see an example of the Red Klumac star with a little Green Klumac at the end

Red (Klumac)

Strontium Nitrate	50
KCLO4	15
Parlon	12
Red Gum	8
Magnalium (200-400)	10
Dextrin	5
Boric Acid	2

This is harder to light. Use green meal with +10 silicon and +10 dextrin. Two step prime it using 50/50 composition and meal/silicon for the first layer and then the meal/silicon mix for the second. Total prime is about 1/16".

Gorski Independence Red (a variation)

Red Metallic Fueled Star:
Name: Screen-cut, Parlon Bound, Brilliant Red (see Gary Smith Parlon Stars below for more on screen cutting)
Source: Variation of Independence Red

Strontium Nitrate 53

Magnalium, granular, -275 mesh 19

Parlon 17

Red Gum 11

NOTES:
add .85 oz acetone to 5.25 oz star batch for 4" shell (added .16 acetone..)
3.4 oz for 21 ounce batch

4T of each prime for a 5.25 oz batch
One 5 oz cup of each prime for a 21 oz batch

sub BaNit for green
25 oz batch of green for 6" shell
(green comp is crumbly,,treat it gently.)

21 oz batch of red for 6" shell
25 oz batch of green for 6" shell (BaNit is heavy)

Red

KCLO3	36
Strontium Carbonate	12
Charcoal	1
Red Gum	4
Dextrin	1

Comments:

It is a chlorate star so all safety warnings apply.

Laquer Red (Eric Hunkins)

Ammonium Perchlorate	41
Strontium Nitrate	20
Hexamine	12
Parlon	13
Sulfur	3
Red Gum	3
Magnalium 200 mesh	8
	100

Burlhorse on UK Rocketry:

Here's another red thats fast, Good Color Depth, Easy to Make (only 4 Chems) and Will light from a cigarette ash at 10 Paces.....

Pot Perc.....70

Strontium Carbonate.....15
Red Gum.....10
Air Float or Willow Charcoal..1
Dextrin.....4

Bleser #1

Above reds are Bleser #1 with PVC

Color - Red Organic (Bleser KP #1) (from Alan Yates with notes)

Name: Red Organic (Bleser KP #1)
Source: David Bleser with comments

Composition:
70 Potassium Perchlorate
15 Strontium Carbonate ***(Creagan:*** *works fine, easy enough to light if well primed)*
10 Red Gum
4 Dextrin
1 Charcoal (airfloat)
+10 PVC (not Bleser - added in by Creagan to lengthen burn time - it also adds to the color)

Preparation:
Screen together well using a 60 mesh screen.

Dampen with water and cut or pump

Comments (borrowed from Alan Yates):

Substitution of the Strontium Carbonate with other metal carbonates for different colors works fairly well:

8 Sodium Bicarbonate: Yellow ***(Creagan:*** works as advertised - burns fairly quickly)
10 Calcium Carbonate: Orange ***(Creagan:*** works as advertised - nice Orange)
20 Barium Carbonate: Green ***(Creagan:*** *did 20/10 Barium Carbonate and PVC. It is a bit washed out but I also did Veline's Green (with Parlon) and it seemed almost as pale - it is a bit harder to light so prime in three layers)*

Bleser #1 burns quickly - almost too quickly. I added in +10 PVC to all the carbonate mixes and that slowed it down a bit and added to the

colors. The picture above shows Bleser #1 with PVC with some sparkler stars and some strobes.

Notes from ukrocketry forum - a thread by BigG and others (see examples at:: http://www.ukrocketry.co.uk/forum/index.php?showtopic=480&st=45)

R1
Sr(NO3)2 65
Dark Al 12
Parlon 18
Red Gum 5

R2
Sr(NO3)2 60
Dark Al 12
Parlon 20
Red Gum 3
Sulfur 5

R3
Sr(NO3)2 62
Dark Al 12
Parlon 18
Red Gum 8

R4
Sr(NO3)2 65
MgAl* 12
Parlon 14
Red Gum 3
Sulfur 6

R5
Sr(NO3)2 60
MgAl* 12
Parlon 25
Red Gum 3

Red (Shimizu)

KClO4 66
Red gum 13
Strontium carbonate 12
Lampblack (or charcoal, I used charcoal) 2
PVC 2
Dextrin 5

bind with 25%/75% alcohol/water

Parlon Red Star

Source: Lifted from Skylighter newsletter at: http://www.skylighter.com/skylighter_info_pages/article.asp?Item=8)

Strontium nitrate	50
Potassium perchlorate	8
Parlon	18 (PVC substituted successfully)
Magnesium/aluminum	12
Charcoal, airfloat	5
Sulfur	5
Red gum	2
Total (parts by weight)	100
Dextrin	+5

Notes: This one is hard to light! It also has a bit of ash. I had it covered with Veline's Prime and it just burnt the prime off leaving the star. Yeesh! However, this sucker does have a strong red color and it lasts a long time (when you get it lit). To be successful on ignition, I had to dust the bottom of the star board with lightly dampened Veline, then 50/50 Veline/composition, then 25/75, then pure composition, then press. I haven't tried it, but green meal with a little silicon or aluminum should work as a prime, too.

Falling Leaves (Chinese colored fuse):

This is also made in green (see green stars below) and other colors. The red is fairly good and the fuse burns slowly. See Skylighter (and cannonfuse.com) for prices. It comes in 96 foot rolls. Cut off 1" pieces and prime one end with NC or Ping Pong Ball/Acetone mix and BP.

The image above links to a demo that used a Black Cat Exploding Comet rocket as the lift platform. The Comets are cheaper Black Cats that can carry a star or two for testing. In this case, it carried a half dozen or more Falling Leaves. Click on the image to see the demo.

CHARCOAL

Chrysanthemum of Mystery

Original Source: Shimizu
This Source: bar talk

This is a slow burning sulfurless mix - ideal for high altitude breaks (rockets).

Airfloat charcoal (try locust else pine): 50
Potassium nitrate: 45
Binder (dextrin, SGRS, etc): 5

Step priming has been recommended.

Willow Diadem

Willow Diadem often has a color core

Charcoal Airfloat 39.17
Potassium Nitrate 31.16
Sulfur 10.68
Dextrin 7.12
FerroTitanium, coarse mesh 4.45
FerroTitanium, finer mesh, 4.45
Titanium, sponge, 40-80 mesh 2.97

Golden Chrysanthemum (PGI)

KNO3 30
AF Charcoal 30
Sulfur 8
Titanium (40-100 sponge) 27
Dextrin 5

Firefly Chrysanthemum (PGI)

KNO3 38
AF Charcoal 40
Sulfur 7
Aluminum Flake (10-18) 8
Dextrin 7

Ferrotitanium (PGI)

KNO3 30.3
AF Charcoal 30.3
Sulfur 6
FeTi (40-100 mesh) 27
Dextrin 6.4

Bright Spider

Meal D (homemade OK) 62
Charcoal (80 mesh) 6.2
Charcoal AF 12.4
Dextrin 4.0
Titanium (40-100 sponge) 15.4

FeTi

KNO3 32

Charcoal (pine)	40
Sulfur	11
Mixed FeTi	15
Dextrin	7.2

Comments:

Three Different meshes of FeTi and Ti were used to make up the 15 parts of FeTi

Swisher Crossette Willow Formula	
Potassium Nitrate	53.69
AF Charcoal	22.82
Sulfur	13.42
Lampblack	4.03
Dextrin	6.04

Blonde Streamer

Source: Bleser

Potassium nitrate 45
Sulfur 6
Charcoal (150 mesh) 29
Dextrin 5
Ferrotitanium 15

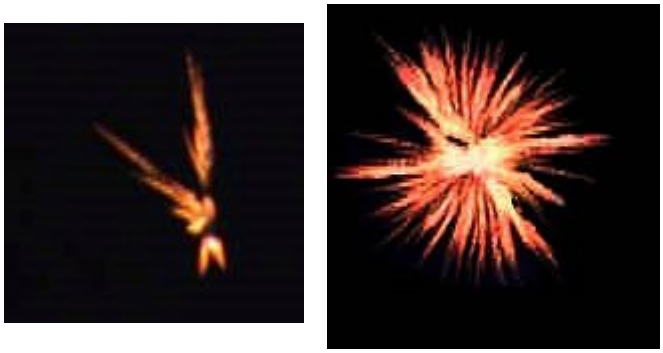
Notes: This is quite nice and the FeTi makes the sparks hang for a while. Easy to light. This is a comet formula but it still works ok as a star - the stars usually stream out quickly then a fire dust lingers for just a bit.

Golden Kumora

(source rec.pyro through Jason Murri - original source is not known at this time)

30.3 potassium Nitrate
30.3 charcoal, af, I used pine charcoal
6.1 sulfur
27.25 FeTi, 40-100 mesh
6.1 dextrin

Chrysanthemum #6
aka: Charcoal fire dust #1



3/8" Chrys #6 using film can shell (left) and a 4" shell (right)

Source: Takeo Shimizu

55 Potassium Nitrate
33 Charcoal (airfloat)
7 Sulfur
5 SGRS (Dextrin can be substituted)

Preparation:
Shimizu says to wet to get KNO3 into charcoal. You can also ball mill for a few hours. After milling, I like to add a metal to make it even sparkier. 15% FeTi is nice - however, when you add in metal, you start getting close to other formulas - with the addition of +15 FeTi, Chrys #6 starts sounding like Blonde Streamer (see below).

Charcoal Streamer Star

Name: Fireflies on Cocaine (Flaming Shit on Your Head)
Source: Bill Kimbrough

Potassium Nitrate 46
Charcoal, mixed 44
Magnalium, granular, 30-60 mesh 10
Sulfur 6
Barium Carbonate 6
Starpol 4.5

Total: 116.5

Transcribed from Passfire

Transcribed from http://skylighter.com/skylighter_info_pages/article.asp?Item=146#firefly

(SL - Probably Ned Gorski): Bill Kimbrough developed the recipe for this star a few years ago. I first saw it at Western Winterblast as a heading in one of Doc Barr's black powder rockets. It was and is spectacular. The effect is sort of like a rich silver twinkling kinda like a firefly, but surrounded by really red glowing embers. Not charcoal orange, but more red than that. The silver and red together are incredible. This is truly a noble star. You learn to make this one, and the girls will throw rocks at all the other boys. If all goes well, and everything burns up where it's sposed to, it is "Fireflies on Cocaine," Otherwise the star is accurately called "Flaming Shit Falls on You."

A couple of notes. All parts are parts by weight; it doesn't matter what they add up to. The pine charcoal is critical. Without it, you ain't got the true Flaming Shit star.

"I like to take the [yellow] pine charcoal as it comes out of the yard grinder, and put it in the ball mill for 10 minutes. Sift out (remove) what doesn't fall through a window screen, and just use the mixed granulation of the charcoal--Better charcoal effect. I mostly roll mine with starpol as a binder, but I have made the formula into comets, stars, and even tried it in lance. Pump, cut or roll, works good for me, but never use starpol as the binder if it is to be the outside of a color change star, as it will surely cause a driven in (moisture) problem."
--Bill Kimbrough

BLUE

Bill Ofca Blue (from a longish discussion on Passfire)

39 Potassium Perchlorate
20 Potassium Chlorate
16 Lactose
10 Copper Carbonate
11 Parlon
4 Dextrin

Baechle 6

Potassium Perchlorate 30
Barium Nitrate 20
Parlon 20
Copper(II) Oxide, black 10
Aluminum, atom, spher, 120-325 mesh, 20 micron 10
Hexamine 6
Red Gum 4

Nedski subs lactose for the hex and screen slices them. (see Gary Smith stars for screen slicing information)

Blue

Bleser AP Blue #20

AP Blue

Ammonium Perchlorate - 68
Hexamine - 17
Copper Oxychloride - 11
Dextrin - 4

Comments:

AP star so do not mix with chlorates. Prime with AP prime and not BP

KCLO3	65
Copper Oxy	12.5
Lactose	12.5
Dextrin	5
Saran (HCB)	5

Comments:

Cheap blue - It is a chlorate star so all safety warnings apply.

Blue from Skylighter article on blues: http://www.skylighter.com/skylighter_info_pages/article.asp?Item=12

B10

Potassium perchlorate	38
Ammonium perchlorate	29
Copper carbonate	14
Red gum	14
Dextrin	5

Blue 49 (Shimizu)

KCLO4	61.2
Parlon	11.6
Red Gum	9.0
Copper Oxide	12.3
Dextrin	4.2
MgAL (optional)	1.5

Blue Star #1 ***(not recommended!)***

Source: Skylighter: http://www.skylighter.com/skylighter_info_pages/article.asp?Item=12

(B2)

Potassium perchlorate	60.8 (much depends on the purity of the perc!)
Parlon	13.0 (Temporarily

misplaced my Parlon - used PVC)

Copper carbonate	12.0
Red gum	9.0
Dextrin	4.8

Notes: This works ok - using more Parlon and no Dextrin and dissolving it in acetone seems to make it better but harder to light. Potassium perchlorates available in the U.S. have a good deal of foreign material in them - be sure you use a fairly pure perc else the color will be washed to white.

Falling Leaves (Chinese colored fuse - get blue at Cannonfuse.com). Click HERE for demo.

Blue Star #2 *(not recommended!)*

Source: I 'discovered' it in isolation while experimenting with colder star compositions and trying to get them to light easier. I have since found it on the UK Rocketry Forum (or near enough).

KClO4 70
PVC 9
CuO 15
Red Gum 10
Dextrin 5 (additional %) (note: UK Rocketry Forum lists SGRS instead of Dextrin)

Blue Star #3 *(not recommended!)*

Source (and comments from the source): Skylighter article on blues: http://www.skylighter.com/skylighter_info_pages/article.asp?Item=12 and from “Chemistry of the Elements" and reprinted in D. Haarmann's “Pyrotechnic Formulary" and elsewhere. Good ignition. This potassium-perchlorate augmented ammonium perchlorate composition was in the minority of tested AP formulae in regards to ignition (Ed. Meaning it was good, not bad). Color saturation was very good and bum rate was acceptable. A good formula

B10

Potassium perchlorate	38 (get the purest ingredients!)
Ammonium perchlorate	29
Copper carbonate	14
Red gum	14
Dextrin	5

Comments: This one was easy enough to make once you have the ingredients. It lights easily and has a good review on Skylighter. It does seem a tad light but still good. I rolled it and primed it with three layers.

Blue Star #4 (recommended - CAUTION - THIS IS A CHLORATE STAR - DO NOT ATTEMPT IF YOU ARE NEW TO PYRO - GET SOMEONE TO HELP YOU UNDERSTAND CHLORATE SAFETY BEFORE ATTEMPTING)

These are from page 216 of Shimzu's FAST - you can choose fast burning or a bit slower burning. Both should be primed.

Blue Star

	Faster	Slower (preferred)
Potassium Chlorate ...	66.5	60.8
Red Gum	9.9	9.0
Cupric Oxide	13.4	xx
Copper Carbonate.....	xx	12.3
Parlon	5.4	13.1
SGRS (Binder)	4.8	4.8

Chlorate Stars

"In keeping with the practice of remaining on topic for posts, this is my favorite blue star comp (it is my modification of a formula originally posted by Shimizu in FAST):

Blue Star

	Star	Lift*	Original from page 216 FAST (formula II) Slower version from same page
Potassium Chlorate	64.5 %	66.5	66.5
			60.8
Red Gum	9.9	9.9	9.9
			9.0
Cupric Oxide	13.4	13.4	13.4
			xx
Copper Carbonate.....	xx	xx	xx
			12.3
Parlon	5.4	5.4	5.4
			13.1
Charcoal	2.0	2.0	2.0
			xx
SGRS (Binder)	4.8	2.4	4.8
			4.8

Lights easily, burns fast, good blue color.

Editor's note: This burns very fast. Cut them larger than you normally would - start with 1/2" for a 3" shell. I didn't use a prime since they seemed to grab fire very easily. No prime works but you might want to put on a thin one anyway just for protection of the chlorate surface-to-surface contact.

*Experimental attempt at making a blue lift for mines - the intent was to have a pure blue wall instead of getting interference from the orange sparks of 2FA.

Bill, I don't think Ofca's blue is in the formula database, but here it is:

KClO3 .65
Cu Oxychloride .13
Lactose .13
Chlorowax .05
Dextrin .04

Dampen with water only
cut 1/2" cubes (kinda messy)
or roll into round stars (rolls great)

ned

Blue Pyro Science	
Potassium Perchlorate	66.1
Copper Oxide	13.4
Parlon	10.7
Red Gum	9.8
Dextrin	5
	105

Blue Stars with Paris Green from a post by Harry Conover on rec.pyrotechnics

Right out of Tenney Davis's book, here is the first one for a 'non-

electric' star comp.,

Potassium Chlorate	48
Paris Green	18
Barium Nitrate	16

Dextrin	3
Shellac	10

This comp produces very intensely color saturated blue stars, but
other than for test shells, I've never use it in preference to the following composition, which for many years was mainstream fireworks
suppliers. The following formulation gained popularity when the cost
of powdered aluminum rapidly decreased. It is the 'blue electric star'. Davis lists this formulation, which he attributes to which he
attributes to Allen F. Clark.

Potassium Chlorate	32
Aluminum	8
Paris Green	16
Dextrin	2
Shellac	1

John Reilly's Blue (revisited)

After rereading Shimizu's "Fireworks From A Physical
Standpoint" about a year ago, I dropped the PVC component in the mix
to only 5% and upped the chlorate and shellac.

Potassium Chlorate	62%
Black Copper Oxide	20
PVC	5
Shellac	9
Dextrine	4

Chinese Blue (works best in small stars. Fades as you go bigger)

46 KCLO4
26 CuO
15 S
5 HCB
3 MgAl
5 Phenolic Resin (looking for substitute - maybe shellac or red gum and then wet with alcohol)

PURPLE

Purple (from Mike S. and others)

Potassium chlorate 24
Strontium carbonate 3-3/4

Copper oxychloride 2-1/2
Shellac 4
Hexachlorobenzene 2
Dextrine 1-1/2

"This gives a very clear pure lavender-purple color and is useful for making wafers for married comets or for pillbox stars. If you don't have HCB, Saran might be the best substitute."

<from LK>

To speed this up but with less color saturation, use the following formula:

	lbs	4Kg	% (rounded)
Potassium chlorate	24	2543	63.6
Strontium carbonate	3-3/4	397.35	9.9
Copper oxychloride	2-1/2	264.9	6.6
Shellac	2	211.9	5.3
Red Gum	2	211.9	5.3
Saran	2	211.9	5.3
Dextrine	1-1/2	158.9	4

Purple (Steve Majdali)

KCLO4	50
Strontium Nitrate	8
Copper Oxide	13
Parlon	15
Magnalium (200 mesh)	3
Red Gum	7
Dextrin	4

Purple Shimizu KP #2

64 Potassium Perchlorate (note that you can substitute KCLO3 and get better results but then you have a chlorate star)
9.5 Red Gum
8.7 Parlon
7.8 Strontium Carbonate
5.2 Copper Oxide (black)
4.8 Dextrin

Purple Pyro Science

Potassium Perchlorate	70.9
Strontium Carbonate	5.45
Copper metal	3.65
Red Gum	10.9
Parlon	9.1
Dextrin	5
Copper Oxide	1

Purple Star (John Reilly)

This is a very nice chlorate "violet purple" Giovanni Forli sent me
some time ago and I like it a lot:

Potassium Chlorate	1 kilogram
Black Copper Oxide	220 gms.
PVC (very fine dust)	160 gms.
Strontium Carbonate	160 gms.
Red Gum	100 gms.
Gum Arabic	60 gms.

Damp with water and cut or roll. Makes a fast burning, easily lit
star. I prime lighly with fine meal. If you use Parlon instead of PVC, it may change the color and burn slightly. Also, this is more on
the blue side of "purple" than the red. Hardt also has some very good
compositions for purple using chlorate as well as perchlorate.

John Reilly.

Yes. As Pyrotec said, gum arabic (acacia gum) can be substituted with
dextrine with little noticable difference. I'd probably go to 4.0 or
4.5% dextrin though and adjust the red gum and pvc down 1% total. You
can also make a nice blue chlorate star with this kind of mix:

Potassium Chlorate	60%
PVC	10%
Copper Oxide (black or red)	20%
Shellac	6% (red gum can be used also)
Dextrine	4%

Damp w/water and cut or roll. Light BP prime. This isn't quite as
good as the KClO3/Paris Green,HCB, with stearine, or lactose and
shellac and dextrine but it's better than many in my opinion and lights
easily.

John Reilly

GREEN

Green (Klumac)

Barium Nitrate	50
KCLO4	15
Parlon	12
Red gum	8
Magnalium (200-400)	10
Dextrin	5
Boric Acid	2

This is harder to light. Use green meal with +10 silicon and +10 dextrin. Two step prime it using 50/50 composition and meal/silicon for the first layer and then the meal/silicon mix for the second. Total prime is about 1/16".

Green star #1
Veline's Green and Bleser #1 (substituting Barium Carbonate and PVC (20/10) for the Strontium Carbonate) have been tried. *Both are pale*. Bleser #1 is explained under RED. Veline's green is:

Barium Carbonate	15
Barium Nitrate	24
Potassium Perchlorate	30
Magnalium	11
Red Gum	5
Parlon	15
Dextrin	5

I dampened with 35% alcohol and primed in three layers

Green star #2
Bright Green (Best of AFN III, p. 115, seen first in Tom Perigrin's Book "Introductory Practical Pyrotecnics")

Potassium Perchlorate ...	30
Barium Carbonate	19
Magnalium	30
PVC	12
Red Gum	4
Dextrin	4

Comments: Triple primed. This is harder to light and is certainly Bright Green.

Falling Leaves (Chinese colored fuse) Click HERE for demo.

This is probably the best substitute for green stars

(as long as you buy the green Falling Leaves!). You don't have to worry about Barium compounds and it is fairly cheap. See Skylighter (and cannonfuse.com) for prices. It comes in 96 foot rolls. Cut off 1" pieces and prime one end with NC or Ping Pong Ball/Acetone mix and BP.

Green star #3

Source: Composition from Shimizu
Preparation:

Barium nitrate.....28.3
Potassium Perchlorate.....47.2
Parlon.....4.7
Red Gum.....14.2
Soluble Glutinous Rice Starch.....5.6 (I substituted Dextrin)

Comments: This one is easy enough to make and *lights easily,* too. I rolled it and primed it with three layers. It might be the best of the non-metallic greens I've tested so far and might qualify as a 'good enough' based on an 'ok' color and ease of ignition. The break above (a 1 3/4" Easter Egg) was almost 100%.

Green

KCLO3 22
Barium Chlorate 43
Barium Nitrate 9
Red Gum 22
Dextrin 4
+10 water

Comments:

This is the brightest non-metallic green I have seen. I have only observed this - I haven't made it. It is a chlorate star so all safety warnings apply.

Tim's Green

Barium Nitrate 60
Magnalium 12
Parlon 23
Dextrin 5

YELLOW

Yellow

Barium Nitrate	60
Dark aluminum	16
Cryolite	8
Parlon	5
Sulfur	4
Dextrin	6
Boric Acid	1

Comments:

I found a yellow star that is completely awesome. It is intense, medium easy to light, and medium speed. It easily stands with the green and red metallics. I'm considering a three color rolled star with all metallic colors. This formula is down here because I have only observed it but not actually made it. This is Jim Widman's formula.

See Veline (again) and also see the Bleser #1 comments under the 'Red Star' section

Yellow Shimizu

KClO4 68
red gum 18
NaNO3 7
charcoal 2
dextrin 5

bind with 25% alc

Gold Flitter??

Source: Visser

Comments: The particle sizes of aluminum powders will markedly affect the result. If Al bronze is available, you can use all 16 parts of it instead of the two different Al powders.
Preparation: Add water and proceed as usual.

Potassium nitrate, fine.....16
Sulfur.....3
Charcoal, powdered.....2
Sodium oxalate or Ultramarine.....4 or 2
Fine, grey aluminum powder (preferably pyro Aluminum).....11
Flake Aluminum or medium Al powder (Al bronze works well).....5
Dextrin.....4

Notes: Lots of ash but it does look gold and it does flitter

Falling Leaves (Chinese colored fuse - get yellow at cannonfuse.com) Click HERE for demo.

white star
Potassium nitrate 59%
Sulfur 30%
black powder 11%

Notes from ukrocketry forum - a thread by BigG and others (see examples at:: http://www.ukrocketry.co.uk/forum/index.php?showtopic=480&st=45)

Silver Star
kno3 : 60
Al spherical 200 mesh : 20
Sulfer : 14
Charcoal : 6
boric acid : 1
dextrin : 5

OR

Potassium Nitrate.....50
Sulphur.....30
Aluminium.....20
Binder.....+5
(Boric Acid.....+1)

This composition makes a bright golden white. I think a true silver is probably reserved for barium nitrate or potassium perchlorate compositions, but this one is pleasing enough. For a binder I have used NC laquer (this was just added until the composition was cuttable, and was not exactly 5%) and dextrin (this was 5%). It will need an intermediate prime. In my experience, BP just burnt off, leaving it unignited.

Note that today, true "white stars" are credited for the metallic addition of Magnesium, or the organic

(more common) inclusion of antimony trisulphide. You can also use Antinomy Metal powder. Formulas containing KNO3, Sulphur, and Antinomy will burn with a brilliant white much better then the white posted in the quote.

For Example:

Davis: (Creagan note - this is great and is listed at the top of this composition listing as a 'tried and true' formula)
KNO3: 62
Antinomy (III) sulphide: 17
Sulfur: 17
Dextrin: 3

Lancaster:
KNO3: 51
Sulfur: 18
GP: 15
Antimony Metal: 10

C (+150 mesh): 3
Dextrin: 3

Working many years with white formulas that utilize KN03, S and C (with or without AL), I had to redefine my understanding of “White" after using Davis formula.

White #1 (source: E. Hunkins)

Potassium Nitrate 61.53
Sulfer 20.51
Antimony Trisulfide 10.25
Meal 3.84
dextrin 3.87

White Antimony (Davis)

KNO3: 62
Antinomy (III) sulphide: 17
Sulfur: 17
Dextrin: 3

Comments: This is a nice star. It lights fairly easily (I used a good single coating of Veline's Prime), and it is not terribly expensive except for the antimony. The white is bright and pretty and it burns a medium amount of time.

White Strobe

Click on the above picture to view the .wmv movie of a White Strobe test (500k)

Source: United Nuclear White Strobe Stars (from: www.unitednuclear.com/stars.htm - since removed - probably stolen from Bleser)

Barium Nitrate 51
Potassium Nitrate 7
Sulfur 19
Magnalium .....18 (60 to 100 Mesh)
Dextrin 5

Comments: This seems to be a really easy star formula - it rolls exceptionally well and it definitely strobes. I primed it with three layers - but it lights ok - it's just that I have a hard time getting Barium Nitrate so the cost is pretty high and I want the stars to work. Click on the image above to see a test flight (using one of the high reliability 3/8" rockets with titanium delay - see rockets.html). The payload is two 5/16" strobe stars. The strobe stars almost hit ground - but not quite. They definitely last a good long time. I like 'em!

Chinese Strobe Stars (from a post by John Reilly on Passfire)

"Red Blinking"
Strontium Nitrate 58%
Potassium Nitrate 5
HCB 15 (or Saran)
Mg/Al alloy powder 18
Sulfur 4
Nitrocellulose "paste" additional 25% to damp

"Green Blinking"
Barium Nitrate 65%
Potassium Nitrate 13
Mg/Al alloy powder 17
Sulfur 5
Shellac "paint" 20% solution in alcohol addl. 14%
Rosin "paint" 40% solution in alcohol addl 4%

Falling Leaves (Chinese colored fuse - get white at

cannonfuse.com) Click HERE for demo.

WHITE STAR

Formula #1 (modified)
Potassium Nitrate 63.59
Sulfur 20.63
Antimony Trisulfide, Dark Pyro, 325 mesh 10.13
Dextrin 5.06
Charcoal Airfloat 0.56

This is what we used for white in red-white-blue-report 3-break shells at the All-American display at last year's PGI convention. It is a nice neutral white

and doesn't overpower the non-metal red and blue chlorate stars used in the other breaks. It is only slightly modified (by adding dextrine in the modern manner) from the composition used for white stars by Southby at Woolwich c. 1850.

-Mike Swisher

SMOKES

Black Smoke Stars (Daylight Stars - Shimizu)

Potassium chlorate 44
Antimony 24
Napthalene 26
Dextrin 6

Use quickly else keep very tightly sealed. The Napthalene will evaporate if the stars are left in a device or left unsealed. The resultant star would be very sensitive. Always press these mixtures.

Another version by Ken Miller:

potassium chlorate - 60 %
napthalene, - 20 mesh (crushed flakes or mothballs are just fine) - 40%
antimony sulphide, dust - +4%

This mix was meant to be safer than the Shimizu version - and looks like it should be. Put this in a 1" tube with 1/2" nozzle or no nozzle. Light with a slight bit of comp and blackmatch. Always press these mixtures.

An Easy Black/Gray Smoke (military formula) that produces volumes

Hydrochloroethane 45 (get it on eBay)

Zinc Oxide 45
Dark Aluminum 10

Prime using 50/50 smoke mix and meal then 100 meal.

Using dyes for smokes

First off, get good dyes - they are quite expensive so be prepared. Here is an edited version of Ken Miller's comments about how to make good smoke cartridges

The basic formula is:

50% dye
30% KCLO3
20% sugar (confectioner's sugar works)

1) In a 2" ID, we use, most commonly, a 3/4" vent hole but 3/8" would be a bit better.
2) The mix should be pressed. We use line pressures anywhere from 500 to 1100 psi on 2" items. Not sure if that helps.
3) Any fine sugar sugar will work. For most items, we use confectioners dust. Ideal is anhydrous dextrose. Scam a free sample and ball mill.
4) Dampen yer smoke comp with NC/solvent as making pulverone. Press by hand into the bottom of the container and cover air-tight. Let sit 30 minutes. Granulate as pulverone. Granulate again. Let dry.

Now you have dust-free, fast/faster burning granules that are a joy to handle and easy to press. The additional mixing helps as the dye soaks into the chems.

If you really want to see the goodness, add a little 2-3% antimony sulfide to the mix. This was common during WWI and don't worry, it won't blow up in yer face. Just handle it as you would any friction sensitive mix, in other words, the same way you should be handling this stuff anyway. Do not add more than 3% antimony sulfide else the mix will become too energetic.

OTHER

Winokur Silver C

Glitter Star:
Name: Win Silver C Glitter Star
Source: Modified Winokur gerb formula by Ned Gorski
Convert from Meal

Meal Powder 65
Antimony Trisulfide, Chinese needle 13
Barium Carbonate 10
Aluminum, atom, spherical, 325 mesh, 32 micron 7
Dextrin 5

Oglesbys "Better Pearl"

47 KNO3
10 Ba(NO3)2
10 Al [i used the cheap 50Ã‚Âµ Al]
18 Sulfur
10 Charcoal [I used coffee grinder-milled willow charcoal]
5 Dextrin

from UK Rocketry forum: "Its a very cheap star, but it spreads blinking bits everywhere "

Freeman Aqua (Source: Jim Freeman from a Passfire post)

My favorite is a chlorate star.

BaClO3 - 32
KClO3 - 32
red gum - 16
BaCO3 - 8
PVC [or other chlorine donor] - 6
dex - 4

copper oxychloride to get your best version of aqua. My recommendation is somewhere around 2 to 2-1/2%. If you get to 3%, it likely will be a very expensive, but beautiful, blue.

Sometimes the aqua color is better using lactose, rather than gum, or half and half. The lactose burns cooler and that makes a better blue. For cutting, lactose often sticks to the knife. For rolling, it might be an advantage. I have not tried it with stearin.

Orange (Joel Baechle)

KCLO4	53
Strontium Carbonate	20
Sodium Oxalate	7
Potassium Benzoate	3
Rosin (sub. red gum)	13
AF Charcoal	3
Dextrin	4

Special Effects Star:

Click on picture to see the movie
~1/2" Blonde Streamer round star and 3/16" flash core.
Star gun launch with 1/2 gram of Benzolift.

Name: Flash Core
Source: David Bleser (as listed on Passfire)

Barium Nitrate 66
Aluminum, flake, dark, German Blackhead. 3 micron 27
Dextrin 6
Boric Acid 1

Preparation: Must use flash core igniter formula as a prime (see igniter prime below). Roll with 50/50 water/alcohol, not exceeding 3/16" diameter and dry. Roll at least 1/32" thick igniter prime before rolling on next layer of star comp. Star must be moving through the air to accurately test for proper operation. Click on the above picture to see a short movie of the flash core in action.

Glitters

Buttered Popcorn Glitter (Lloyd Sponenburgh)

Buttered Popcorn Glitter (posted once before but this is an update with comments from Lloyd... posted with permission)

5lb.....Meal-D ....
6oz..sodium bicarbonate ....
9oz..antimony sulfide -325 mesh ....
8oz..Fine spheroidal Al (service X-fine) ....
6oz..dextrin

"Work the bicarb up and down by 1% amounts (1% of the bicarb amount) to increase or decrease the spritzel delay. It's simple, and will work properly with from 3% to 8.5% moisture when pressed; use JUST enough to make it cohere well at the pressure you're using.

For granulating, usually about 800-1000ml of water per 16lb batch works out just right. Linda named it "Buttered Popcorn Glitter". The spritzel puffs are roughly 3/4" in diameter, and a rich buttery gold. I roll it into stars, press it into comets, and granulate it for pressing.

SOP is that all my formulae contain binders. Even with granulated comps, the binder makes it less dusty to press, and easier to granulate with less moisture -- and too much moisture is the enema .. ur... eneMY... of glitters. BTW... the amount of water used to granulate is usually considerably higher than that used to press. The 800ml is roughly 11%. But it doesn't seem to hurt the glitter, probably because I dry granulates rapidly in very shallow layers, preventing the sort of reactions that might cause them to deteriorate."

Editor's note: I asked Lloyd for permission to post this, he added the following:

Danny, that's fine. You might also add "(late comment -- as little as 200ml of water per 16lb batch works well for high-pressure pressing into comets, crossettes, etc.)

You might note for the readers that the batch represented is NOT a 16lb batch.

<G>

LLoyd

Gold Glitter (from Eric Hunkins)

Gold Glitter

- 50% Potassium Nitrate
- 20% Sulfur
- 6% Sodium Bicarbonate
- 4% Dextrin
- 10% Magnalium
- 10% Charcoal

Gold Glitter (PGI Bulletin)

Here is the gold glitter formula from the PGI bulletin number 148:

KNO3	48
Air Float Charcoal	9
Sulfur	9
Sb2S3	10
Al Atomized 12 mic.	14
Sodium Oxalate	7
Barium Carbonate	1
Dextrine	5

I bound these stars with home made flour paste, as made from the passfire site directions. I used enough paste to get the material so that it was stiff dough and shiny, but not runny. The stars burn about as fast as a chlorate color star, so you can cut them pretty large if you want. They light very easily with a flash bag provided you use a good amount of BP prime so that they have a little time to slow down before they ignite, insuring their continued burning.

Winokur Glitters

Winokur Glitters (formulas only - not completely sure these are all accurate so double check if you don't get what you want on a test batch)

Winokur #1

Potassium Nitrate 35
Strontium Nitrate 15
Charcoal Airfloat 13
Magnalium Granular -200 mesh 12
Sulfur 10
Antimony Trisulfide, Chinese Needle 10
Dextrin 5

Pinkish glitter. Hygroscopic, but useable.

Pinkish glitter. Hygroscopic, but useable.

Winokur #2

Potassium Nitrate 40
Strontium Nitrate 10
Charcoal Airfloat 13
Magnalium Granular -200 mesh 12
Sulfur 10
Antimony Trisulfide, Chinese Needle 10
Dextrin 5

Pinkish glitter. Hygroscopic, but useable.

Winokur #3

Potassium Nitrate 50
Magnalium Granular -200 mesh 12
Antimony Trisulfide, Chinese Needle 10
Sulfur 9
Charcoal Airfloat 8
Strontium Carbonate 6
Dextrin 4

Pinkish glitter. Hygroscopic, but useable.

Winokur #4

Potassium Nitrate 50
Magnalium Granular -200 mesh 12
Antimony Trisulfide, Chinese Needle 10
Sulfur 9

Charcoal Airfloat 8
Sodium Oxalate 6
Dextrin 4

Pinkish glitter. Hygroscopic, but useable.

Winokur #5

Potassium Nitrate 40
Sodium Nitrate 10
Charcoal Airfloat 10
Antimony Trisulfide, Chinese Needle 10
Sulfur 9
Magnalium Granular -200 mesh 9
Sodium Oxalate 8
Dextrin 4

Pinkish glitter. Even more hygroscopic than win 1-4, but useable.

Winokur #6

Potassium Nitrate 53
Antimony Trisulfide, Chinese Needle 16
Charcoal Airfloat 13
Sulfur 9
Aluminium, Flake, bright -325 mesh, 36 micron 4.5
Dextrin 4.5

A white glitter with a rather high percentage of antimony trisulfide.

Winokur #7

Potassium Nitrate 35
Barium Nitrate 20
Sulfur 14
Charcoal Airfloat 10
Aluminium, atom, spher, 120-325 mesh, 20 micron 9
Sodium Oxalate 8
Dextrin 4

Gold glitter that uses sodium oxalate to enhance the glitter without the use of antimony trisulfide. Sodium bicarbonate may replace the oxalate with similar results.

Winokur #8

Potassium Nitrate 37
Barium Nitrate 15
Sulfur 15
Magnalium Granular -200 mesh 13

Charcoal Airfloat 10
Iron (III) Oxide, red 6
Dextrin 4

White glitter that uses iron oxide and sulfur to replace antimony trisulfide. While the effect is inferior to antimony, the formula is still useable.

Winokur #9

Potassium Nitrate 35
Barium Nitrate 20
Magnalium Granular -200 mesh 12
Charcoal Airfloat 10
Sulfur 10
Antimony Trisulfide, Chinese Needle 9
Dextrin 4

Good white glitter that uses barium nitrate as both the oxidizer and the "retardant."

Winokur #10

Potassium Nitrate 35
Barium Nitrate 20
Sulfur 17
Aluminium, atom, spher, 120-325 mesh, 20 micron 14
Charcoal Airfloat 10
Dextrin 4

Excellent white glitter with long tail, fine grain and dense

Winokur #11

Potassium Nitrate 40
Barium Nitrate 20
Aluminium, atom, spher, 120-325 mesh, 20 micron 14
Sulfur 10
Charcoal Airfloat 10
Dextrin 5

Excellent white glitter with long tail, fine grain and dense.

Winokur #12

Potassium Nitrate 40
Barium Nitrate 20
Aluminium, atom, spher, 120-325 mesh, 20 micron 14
Sulfur 10
Charcoal Airfloat 10
Dextrin 5

Iron (III) Oxide, red 1

Excellent white glitter with long tail, fine grain and dense.

Winokur #13

Potassium Nitrate 50
Antimony Trisulfide, Chinese Needle 10
Charcoal Airfloat 9
Sulfur 9
Aluminium, atom, spher, 120-325 mesh, 20 micron 6
Dextrin 4
Magnalium Granular -200 mesh 3

Off-white glitter with attractive lacy effect.

Winokur #14

Potassium Nitrate 50
Sulfur 11
Charcoal Airfloat 10
Aluminium, atom, spher, 120-325 mesh, 20 micron 8
Dextrin 5
Antimony Trisulfide, Chinese Needle 5
Sodium Bicarbonate 5
Magnalium Granular -200 mesh 4

Off-white glitter with attractive lacy effect.

Winokur #15

Potassium Nitrate 48
Magnalium Granular -325 mesh 14
Antimony Trisulfide, Chinese Needle 10
Charcoal Airfloat 9
Sulfur 9
Sodium Bicarbonate 7
Dextrin 4

Gold magnalium glitter. Large flashes, good delay and long tail.

Winokur #16

Potassium Nitrate 48
Magnalium Granular -200 mesh 12
Charcoal Airfloat 11
Sulfur 9
Antimony Trisulfide, Chinese Needle 9
Sodium Bicarbonate 7
Dextrin 4

Gold glitter almost identical to Win 15, with large flashes, good delay and long tail.

Winokur #17

Potassium Nitrate 47
Charcoal Airfloat 13
Sulfur 13
Magnalium Granular -200 mesh 12
Antimony Trisulfide, Chinese Needle 10
Dextrin 5

Similar to Win 15 and 16 except white in color instead of gold.

Winokur #18

Potassium Nitrate 50
Sulfur 15
Magnalium Granular -200 mesh 13
Charcoal Airfloat 10
Antimony Trisulfide, Chinese Needle 7
Dextrin 5

Similar to Win 15 and 16 except white in color instead of gold.

Winokur #19

Potassium Nitrate 50
Sulfur 20
Charcoal Airfloat 10
Magnalium Granular -200 mesh 10
Sodium Bicarbonate 6
Dextrin 4

Coarse gold glitter with short tail and moderate density. The advantage is that it doesn't contain antimony trisulfide, making it a cheaper glitter comp.

Winokur #20

Potassium Nitrate 48
Sulfur 17
Magnalium Granular -200 mesh 12
Charcoal Airfloat 10
Sodium Bicarbonate 5
Iron (III) Oxide, red 4
Dextrin 4

Gold glitter similar to Win 19, with very long delay creating more of a gold strobe effect. Note the absence of antimony.
Posted by: blindreeper Posted on: February 4th, 2005, 6:28pm

Winokur #21

Chemical Name Parts
Potassium Nitrate 52
Sulfur 15
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 6
Antimony Trisulfide, Chinese Needle 6
Sodium Bicarbonate 6
Dextrin 5

Medium grained dense gold glitter using baking soda as a burning inhibitor and glitter enhancer.

Winokur #22

Potassium Nitrate 50
Sulfur 18
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 8
Sodium Bicarbonate 6
Antimony Trisulfide, Chinese Needle 4
Dextrin 4

Medium grained dense gold glitter using baking soda as a burning inhibitor and glitter enhancer.

Winokur #23

Potassium Nitrate 50
Sulfur 20
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 8
Sodium Bicarbonate 8
Dextrin 4

Medium grained dense gold glitter using baking soda as a burning inhibitor and glitter enhancer. Note the absence of antimony.

Winokur #24

Potassium Nitrate 52
Sulfur 21
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 6
Sodium Chloride 6
Dextrin 5

Produces a good gold glitter with excellent color and good delay. Unfortunately, it is quite hygroscopic.

Winokur #25

Potassium Nitrate 52
Sulfur 17
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 6
Sodium Bicarbonate 5
Iron (III) Oxide, red 5
Dextrin 5

A silver glitter with fairly large flashes and a medium short tail. No more than 8% water can be used when mixing. The low usage of expensive metals makes this a very cheap formula ideally suited for comets.

Winokur #26

Potassium Nitrate 52
Sulfur 21
Charcoal Airfloat 10
Aluminium, Flake, bright -325 mesh, 36 micron 6
Iron (III) Oxide, red 6
Dextrin 6

A silver glitter with fairly large flashes and a medium short tail. The low usage of expensive metals makes this a very cheap formula ideally suited for comets.

Winokur #27

Potassium Nitrate 50
Antimony Trisulfide, Chinese Needle 10
Charcoal Airfloat 9
Sulfur 9
Aluminium, atom, spher, 120-325 mesh, 20 micron 9
Sodium Bicarbonate 9
Dextrin 4

A fine grained off white glitter that produces small but symmetrical flashes. Fallout with this formula is large enough to pose a potential problem

Winokur #28

Potassium Nitrate 50
Antimony Trisulfide, Chinese Needle 10
Charcoal Airfloat 9
Sulfur 9
Sodium Bicarbonate 9
Aluminium, atom, spher, 120-325 mesh, 20 micron 6
Dextrin 4

Aluminium, Flake, Dark, American Dark, -325 mesh 3
A fine grained glitter that produces small but symmetrical flashes. Dark aluminium is added to solve problems with fallout and increase flash density.

Winokur #29

Potassium Nitrate 50
Sulfur 15
Charcoal Airfloat 10
Antimony Trisulfide, Chinese Needle 10
Aluminium, atom, spher, 120-325 mesh, 20 micron 7
Sodium Bicarbonate 7
Dextrin 4

Aluminium, Flake, Dark, American Dark, -325 mesh 1
A fine grained glitter that produces small but symmetrical flashes. Dark aluminium is added to solve problems with fallout and increase flash density.

Winokur #30

Potassium Nitrate 50
Antimony Trisulfide, Chinese Needle 10
Charcoal Airfloat 9
Sulfur 9
Aluminium, atom, spher, 120-325 mesh, 20 micron 8
Sodium Bicarbonate 6
Aluminium, Flake, Dark, American Dark, -325 mesh 4
Dextrin 4

A fine grained glitter that produces small but symmetrical flashes. Dark aluminium is added to solve problems with fallout and increase flash density.

Winokur #31

Potassium Nitrate 45
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Barium Nitrate 10
Charcoal Airfloat 10
Sulfur 10
Dextrin 5
Iron (III) Oxide, red 4
Barium Carbonate 4

Excellent, cheap white glitter with medium sized flashes.

Winokur #32

Potassium Nitrate 38
Barium Nitrate 14

Sulfur 13
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Charcoal Airfloat 10
Iron (III) Oxide, red 8
Dextrin 5

Excellent, cheap white glitter with medium sized flashes.

Winokur #33

Potassium Nitrate 43
Barium Nitrate 13
Aluminium, atom, spher, 120-325 mesh, 20 micron 13
Charcoal Airfloat 10
Sulfur 10
Iron (III) Oxide, red 7
Dextrin 4

Excellent, cheap white glitter with medium sized flashes.

Winokur #34

Potassium Nitrate 40
Barium Nitrate 16
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Charcoal Airfloat 10
Sulfur 10
Dextrin 5

Excellent, cheap white glitter with medium sized flashes.

Winokur #35

Potassium Nitrate 36
Barium Nitrate 16
Sulfur 13
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Charcoal Airfloat 10
Iron (III) Oxide, red 8
Dextrin 5

Excellent, cheap white glitter with medium sized flashes.

Winokur #36

Chemical Name Parts
Potassium Nitrate 43
Barium Nitrate 16
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Charcoal Airfloat 10
Sulfur 10
Iron (III) Oxide, red 10

Dextrin 4

Excellent, cheap white glitter with medium sized flashes.

Winokur #37

Potassium Nitrate 40
Barium Nitrate 14
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Sulfur 11
Charcoal Airfloat 10
Iron (III) Oxide, red 7
Dextrin 4
Barium Carbonate 2

Excellent, cheap white glitter with medium sized flashes.

Winokur #38

Potassium Nitrate 40
Barium Nitrate 13
Sulfur 12
Charcoal Airfloat 12
Aluminium, atom, spher, 120-325 mesh, 20 micron 12
Iron (III) Oxide, red 7
Dextrin 4

White glitter with medium size flashes. Charcoal is the burning retardant.
Taken from Pyrotechnica II.

Winokur #39

Potassium Nitrate 51
Charcoal Airfloat 19
Antimony Trisulfide, Chinese Needle 12
Aluminium, atom, spher, 120-325 mesh, 20 micron 8
Barium Carbonate 5
Dextrin 5

Excellent, cheap white glitter with medium sized flashes.

Winokur #40

Potassium Nitrate 51
Charcoal Airfloat 19
Antimony Trisulfide, Chinese Needle 12
Aluminium, atom, spher, 120-325 mesh, 20 micron 9
Barium Carbonate 5
Dextrin 4
Magnalium, granular, -60 mesh 2.5

Use 2% barium carbonate for first prime layer.

Swisher Glitter (can be cut)

24 lbs. home made meal powder 384 oz, 65.3 %
4 lb. 8 oz. antimony sulphide 72 oz, 12.25 %
3 lb. Reynolds No. 120 atomized aluminum 48 oz, 8.1 %
1 lb. 8 oz. strontium carbonate 24 oz, 4 %
1 lb. 8 oz. sodium oxalate 24 oz, 4 %
2 lb. 4 oz. dextrine. 36 oz, 6.1 %

Sieve chemicals individually once through 40 mesh. Blend by hand and sieve 3 X through 20-mesh.
Aq. 3 lbs (48 / 588 = 8.1) to pump, 5 1/2 lbs (88 / 588 = 15) to cut

With a hobby mill, it is common to make 1000 grams of home made meal. If you do that then, the following are the ratios:

Meal - 1000 grams
Antimony Sulfide - 187 grams
Atomized Aluminum - 124 grams
Strontium Carbonate - 61.4 grams
Sodium Oxalate - 61.4 grams
Dextrin - 93.4 grams

Water to cut - 230 grams (Ed: water varies according the charcoal used - my test batch took over 350 grams)

Gold Twinkler Glitter from Ned Gorski (on Passfire and on Skylighter)

Black powder meal 0.68
Atomized aluminum 0.08
Antimony trisulfide 0.08
Sodium oxalate 0.11
Dextrin 0.05

Pumping is best. Use just enough water to bind in a star pump (5%?)

Eric's Silver Flitter (Eric Hunkins) #1

Potassium Perchlorate	60
Dark Aluminum	21

Aluminum Flitters	10
Charcoal	2
Dextrin	7

Silver Flitter (PGI)

KCLO4	39.1
Red gum	7.6
Atomized Al (-325)	36.6
Magnalium (200 mesh)	6.3
Sulfur	4.4
Boric acid	1.3
Dextrin	4.4

Gold Glitter (from PGI bulletin but probably Degn)

KNO3	48
AF Charcoal	9
Sulfur	9
Antimony sulfide	10
Aluminum 325 atomized	14
Sodium Oxalate	7
Barium Carbonate	1
Dextrin	

D1 Glitter

Source: Tom Rebenclau/Jack Drews and from Alan Yates

Composition:
53 Potassium Nitrate (corrected from 58 on some forums)
18 Sulfur
11 Charcoal (airfloat)
7 Aluminium (-325 mesh, spherical)
7 Sodium Bicarbonate
4 Dextrin

Preparation:
The composition designer suggests dampening with 6% plain water with 1 part of boric acid dissolved in it when pressing comets or pumping stars. It need not be ball milled if your components are already

sufficiently fine, just screen together, moisten and granulate through a coarse sieve ready for pressing/pumping.

Comments
I used it as delay for a 3/8 rocket. It was about 50% slower than RF. It didn't require priming for a light burst but priming would likely be necessary for a hard break..

Ofca's Gold Twinkler etc (source Passfire - Ned Gorski in response to questions about using Meal-D):

Rob, in BAFN III, Bill Ofca has a Chrys 6 formula based on meal D. "The Beautiful 4" Spider Web Shell" uses, in one of the formulae:

Meal D 10
KNO3 7.5
Airfloat 7.5
Sulfur 1
Dex 2

If you do some calculating, you'll see that this is a hot mix with the same proportions as Chrys 6.

My favorite Glitter is Ofca's Gold Twinkler, and as it's base I use a homemade granulated meal, which would probably work with commercial meal, too.

Meal 65
atom.al. 8
ant sulf 8
sod ox 11
dex 5
(3 parts of boric acid are specified, but I don't use it.)

I like this one best if it is only very slightly dampened and then pumped as pumped stars or comets.

Have fun,

And another Ned quote: And, years ago, Charley Wilson turned me onto the fact that in many glitter-type comps, using a somewhat granulated BP as the base, to which the other chems are added, really changes and enhances the effect.

INDY COLORS (from the Internet - not tried)

Indy formulas (in %)

RED (SrN 50, MgAl-325 18, Par 16, RG 10, Dex 5)

RUBY (increase SrN to 62, reduce MgAl to 12, divide chlorine donor into equal parts of saran and parlon)

Emerald (exact same as ruby, sub BaN for SrN)

Note: to deepen a color, increase colorant oxidizer and reduce metal

BLUE (KP 66, CuO 14, Par 5, Saran 5, RG 10, Dex 5)

you can make mauve/magenta by adding SrN for some of the KP

ORANGE (SrN 42, MgAl 12, KP 10, Na Ox 10, Par 9, Sar 9, RG 8,

Dex 5)

you can vary color by ratio of SrN to NaOx

TURQUOISE (BaN 30, CuO 16, KP 14, MgAl 11, RG 9, Par and Saran 7.5 each, Dex 5)

WILLOW DIADEM Airfloat 66, Potassium Nitrate 52.5, Sulfur 18, Dextrin 12, FeTi 30-60 60:40 7.5, FeTi 40-325 60:40, 7.5, Ti Sponge 40-80 5

PRIME

My Favorite Prime (Recent change from the Ti prime)

Name: Silicon Prime
Source: Dan Creagan (and others)

Reactive Charcoal (willow, pine, etc) 15
KNO3 75
Sulfur 10
Silicon .....+10
SGRS (preferred) or Dextrin .....+5

(you can also put it on with a 10% solution of Gum Arabic instead of water or water/alcohol)

Mix the first three ingredients thoroughly. Do not wet. All ingredients should be airfloat except the silicon. Additional benefit can be had by adding +10 diatomaceous earth or some 7F to get it 'bumpy' so it will take fire easily.

My next Favorite Prime (liberally applied to a color core, it has a titanium tail that then turns to the color)

Name: My Favorite Prime
Source: Dan Creagan

Charcoal (airfloat willow): 15
KNO3 (airfloat): 75
Sulfur (airfloat): 10
FeTi or Ti: +15
Dextrin: +5

Hot Igniter Prime:

Name: Flash Core Igniter
Source: Takeo Shimizu (as listed on Passfire)

Barium Nitrate 34
Potassium Perchlorate 33
Aluminum, flake, dark, German Blackhead. 3 micron 10
Antimony Trisulfide, Chinese needle 9
Red Gum 8
Dextrin 5
Boric Acid 1

Veline's priming

Source: Robert Veline

Comments: The wood meal in this prime makes the stars a little 'fuzzy', making the prime easier to take fire. Without the wood meal prime the stars are often blown blind.

Potassium perchlorate.....55
Charcoal, air float.....20
Wood meal, 70 mesh.....6
Red Iron Oxide, Fe2O3.....5
Magnalium (50/50).....5
Potassium dichromate.....5
Dextrin.....4

Lloyd Sponenburgh's Pinball Prime

Hot Igniter Star Prime:

0.71 pot perc
0.14 airfloat
0.09 redgum
0.06 magnalium

Use alcohol as the wetting agent. You can sub dextrin for the redgum and use water if you wish.

Changing Relays

Shimizu Changing Relay #1 and #2

From page 187 of FAST

Changing relay I

KP 35%
KNO3 35%
Hemp Coal (or Paulowina coal) 24%
SGRS 6%

Changing Relay II

KP 81%
Accroides resin 13%
SGRS 6%

Gary Smith Parlon Stars (with permission)

	Red	Orange	Yellow	Green	Aqua	Blue	Purple
Potassium Perchlorate	8	5			15	63	63
Barium Nitrate			60	60	40		
Strontium Nitrate	50	50					
Copper Carbonate						12	4
Copper Oxide					15		
Cryolite		14	15				
Strontium Carbonate							8
Magnalium -325	12	15	15	15	12		
Airfloat Charcoal	5	3					
Hexamine						5	5
Red Gum	2	2	5	5	3	5	5
Sulfur	5						
Parlon	20	15	15	20	15	15	15
Magnalium -60							
Ti Sponge 18-30							
% Parlon	19.61%	14.42%	13.64%	20.00%	15.00%	15.00%	15.00%

Above image courtesy of Lee C. Bussy. All formulas by Gary Smith.

A summary of Gary's comments about the above chart: The formulas for the above stars are nominal. The stars are NOT going to burn at exactly the same speed but they are close. The silver will be the slowest but can be speeded up with finer MgAl. (Edit: I use 60 KCLO4 and 100-200 mesh MgAl)

The above stars are meant to be wetted with lacquer thinner or acetone and sliced through a 1/4" - 1/2" screen - depending on what size stars you want. You can prime them after they have dried a short while. Use a good thick prime.

Another way of making them is to roll the mix out between two pieces of plastic so they are a bit thinner than the ending star size you want. Ned Gorski developed this technique. Here are his instructions:

As opposed to Gary who slices the stars with the screen, and then lets them dry prior to priming them, I dust the star patty with a version of Lloyd's

pinball prime, on both sides of the patty, prior to slicing them through the screen.

Hot Igniter Star Prime:

0.71 pot perc
0.14 airfloat
0.09 redgum
0.06 magnalium

Then, pushing the star patty through the screen starts to embed the prime into the surface of the stars.

After the stars have been sliced, I tumble them in a tub, spritzing them with denatured alcohol to further take up the loose prime, and I put in another dose of the hot prime with some more spritzing.

Then I roll on a 50/50 mix of hot prime/BP prime (bound with redgum), using the same tub/spritzing method.

BP prime:

0.67 KNO3
0.14 airfloat
0.09 sulfur
0.05 magnalium
0.05 redgum

I then finish the priming by rolling on a layer/dose of the BP prime.

This ends up being a nice step-priming system, applied when the stars are fresh from the slicing.

The tumbling and priming produces stars which are almost spherical.

The total prime layers end up being about 1/16" thick.

I'm getting good ignition out of the stars, even in a hard-broken shell.

Gary and I have noticed that the acetone-parlon-bound stars seem to dry even more quickly with the primes applied, as opposed to drying without primes applied.

Other notes by Ned:

add .85 oz acetone to 5.25 oz star batch for 4" shell (added .16 acetone..)
3.4 oz for 21 ounce batch

4T of each prime for a 5.25 oz batch
One 5 oz cup of each prime for a 21 oz batch

20-25 oz for a 6" shell

Veline Star Color System (as lifted from Skylighter newsletter: http://www.skylighter.com/skylighter_info_pages/article.asp?Item=8)

Robert Veline created this system and intentionally put it in the public domain. When you look at it, you can see that it uses very similar ingredients and proportions for many of the different colors, making this an extremely versatile color set: you can create any color you want using only ten chemicals!

When you look at the part called "Now the Fun Stuff" you can even see how to mix an almost limitless palette of colors by mixing the different primary colors shown in the table. A word to the wise: These colors are well balanced in terms of color brightness and intensity. So, Veline's colors seem to appear most pleasing when they are used with each other any given device (shell, mine, etc.). Here's the original paper published by Veline, but formatted differently to fit our newsletter.

A Compatible Star Formula System for Color Mixing

By Robert Veline

	Red	Orange	Green	Blue	Super Prime
Strontium carbonate	15				
Calcium carbonate		15			
Barium carbonate			15		
Copper oxide, black				15	
Barium nitrate			24		
Potassium perchlorate	55	55	30	55	55
Parlon	15	15	15	15	
Red gum	9	9	5	9	

Magnalium (50/50 -200 mesh	6	6	11	6	5
Dextrin	+4	+4	+4	+4	4
Charcoal, airfloat					20
Wood meal, -70 mesh					6
Iron oxide, red					5
Potassium dichromate					5

A Few Notes About These Formulae

The numbers are in percent by weight. The potassium perchlorate is a fine powder. The Swedish stuff is what I used. The parlon was Hercules brand, but Superchlon brand from Ishihara Co. Ltd. also works. Nothing special about the red gum, just fine powder. The best barium and strontium carbonates are obtained from Barium and Chemicals of Steubenville Ohio. The calcium carbonate was -200 mesh 'Whiting'. Copper carbonate may be used rather than black copper oxide without much change in performance. I have tried finer more pure forms and found they have slowed the burn rate, and degraded the color... Note that all of the proportions are the same for the different colors, the exception being the green. The idea is to have as many characteristics, burn rate, brightness, flame size, color purity, and density of powder, common between the different powders, as is possible. While these formulas do not excel in any one characteristic, they are all part of a matched set. The green: I was unable to get a suitable green star for this family without using barium nitrate. So, in order to compensate for the reduced oxidizing ability of the nitrate, a more energetic fuel mixture was used.

Now the Fun Stuff:

YELLOW	55 green	45 orange
CHARTREUSE	80 green	20 orange
AQUA	80 green	20 blue
TURQUOISE	55 green	45 blue
MAGENTA	50 red	50 blue
MAROON	85 red	15 blue

PEACH 60 orange 25 red 15 blue

PURPLE 5 orange 15 red 80 blue

Well, that's it! These stars are the results of a couple of years of hard work, they are offered as some form of repayment to the many people who published information which I have feasted on all these years. THANK YOU!!!! Robert Veline II

Japanese NC Star Patent (posted by Tom S. on Passfire)

amount (parts by weight)		star blue	star red	star green	star yellow	star green	star purple	lance red	lance yellow	lance green
potassium perchlorate		46.40	44.00	40.00	50.50	25.00	40.00	45.00	42.00	40.60
ammonium perchlorate						25.00				
hemp coal		3.60	3.60	3.60	2.00	2.30	1.60	3.00	2.10	3.20
Combustion agent BL	vinsol	6.80	6.80	6.80	6.60	6.00	5.00	7.60	6.50	6.00
chlorinated rubber		6.80	6.80	6.80	6.60	8.00	5.00	7.00	6.50	6.00
phenolic resin	novolac	2.40	2.80	2.80	2.10	1.60	0.90	2.50	1.50	2.10
strontium carbonate			16.00				11.00	16.40		
sodium oxalate					14.70				21.40	
copper oxide		14.00					11.00			
barium nitrate				20.00		15.10				24.60
nitrocellulose		4.00	4.00	4.00	3.50	1.20	10.00	6.80	3.50	3.50
nitromethane						15.80				

nitroethane			14.00				16.50		
nitropropane		16.00				11.70			
dinitro toluene					15.50			14.00	
nitrobenzene	16.00	16.00							
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

The directions are to make a gel with the nitrocellulose and solvent and use it to bind the mix. II really don't think the nitrate solvent is necessary and any ester of ketone could be used. The fuel / chlorine donor combo is interesting. They seem a little lighter in "parlon" than most US formulas and the vinsol/novolac blend would be lower in cost than red gum.

Glusatz - long time delay mix (approximately 30 seconds per inch??)

Source: APC forum and rec.pyrotechnics (Frank Rizzo and Richard Ogden)

Glusatz

Barium nitrate 75.5
Charcoal (AF) 10
Sulfur 10
Meal 3
Cab-O-Sil 1
CMC 0 .5
Dist. water +6 (dissolve CMC first then add remaining ingredients)

Must be rammed into spollette tubes.

Poisonous!

Dark lance composition (Dead Lance)

Source: Mike Swisher on rec.pyrotechnics and attributed to Hardt

A composition using meal D 47% and strontium carbonate 53% is given, No. 5 in Table 15-4, p. 122 of Hardt's "Pyrotechnics." I have used this mixture

and it works well.

Wheel Driver:
Name: Purple Driver
Source: John Glasswick (Passfire Database)

Strontium Nitrate 25
Potassium Perchlorate 25
Parlon 20
Magnalium, granular, -200 mesh 20
Titanium, sponge, 40-80 mesh 15
Red Gum 10
Copper(II) Oxide, black 10
Total: 125

Fountain Formulas

Borrows Heavily from John Glasswick's Gerb Formula Article

Do not tamp any of these. You can hand press them damp and let them dry (takes a few weeks) or you can press them in a hydraulic press. Mr. Glasswick hand presses them dry and they seem to work for him - I would be uneasy with that - especially if I was mixing different effects. Start with chokes that are 1/2 the diameter of the tubes for these mixes.

Chemical	Red	Yellow	Orange	Green	Blue (rec.pyro)	Blue-Green (Chertier)	Lime	Purple	Turquoise
Red Gum	8	8	8	8			8	10	7
Charcoal						16			
Parlon	18	18	18	18			18	20	14
Magnalium	18	18	18	18			18	20	14
Titanium	13	13	13	13			13	15	11
Zinc Dust						45			

Strontium Nitrate	43		28					25	
Sodium Nitrate		18	15				1		
Potassium Nitrate						39			
Barium Nitrate		25		43			42		36
Cupric Oxide (black)					10			10	18
Stearin					20				
Shellac					5				
Potassium Perchlorate								25	
Ammonium Perchlorate					65				

Blue Fountain (from wreck.pyro)

"The granulated mixture
below burns with with a
wonderful deep blue in
a tableau format."

Source: rec.pyrotechnics,
posted by EFFECTS
<effe...@aol.com

Comments:

Preparation: Granulate the
mixture with a small amount
of alcohol. Let dry and press
into tubes. Very slowly
burning mixture. Don't
substitute shellac with red
gum.

Ammonium
perchlorate.....
.7
Stearin.....
.....2
Copper(II)oxide.....
.....1
Shellac.....
.....0.5

Go Getters

This section from an archived United Nuclear Page

Go Getters are essentially rocket propelled stars. They are used in an aerial shell or in the head
of a rocket and when ignited, they burn with a brilliant color (brilliant because the formulas all contain Magnesium powder) and shoot across the sky. Lit on the ground or in the air, they will fly off in a random direction with their bright tail fire. The Magnesium in these formulas will not degrade because of the unique solvent used.

	RED	GREEN	YELLOW	ORANGE
Strontium Nitrate	**50 %**	**-**	**-**	**37 %**
Barium Nitrate	**-**	**50 %**	**44 %**	**-**
Potassium Perchlorate	**5 %**	**5 %**	**4 %**	**12 %**
Magnesium Powder	**13 %**	**13 %**	**11 %**	**12 %**
Parlon	**17 %**	**17 %**	**15 %**	**17 %**
Hexamine	**9 %**	**9 %**	**8 %**	**8 %**
Cryolite	**-**	**-**	**12 %**	**8 %**
Red Gum	**3 %**	**3 %**	**3 %**	**3 %**
Boric Acid	**3 %**	**3 %**	**3 %**	**3 %**

Comments:

The chemicals are first finely powered (if they are lumpy or coarse crystals) then mixed well together.
For the next step, you'll need a small squeeze bottle, similar to those plastic squeeze ketchup bottles you find in a restaurant. Take the mixed formula and slowly add Acetone (while mixing) until it has the consistency of pancake batter. The Acetone will melt the Parlon in the mixture making it plastic & gooey. Be sure to test the squeeze bottle you are going to use first by putting some Acetone in it. Acetone will also melt many plastics, so make sure your squeeze bottle isn't going to melt too. The melted Parlon in the

mixtures will also coat the Magnesium Powder and prevent it from degrading. The Parlon here not only binds the mixture together, but it boosts the color of the flame by providing Chlorine to the burning mixture.

Next, stand some M-80 tubes up end on a sheet of Aluminum Foil. Pump the mixture into them until they are about 80% full. If they are to be used in shells or rocket heads, insert a piece of Black Match (that's Quickmatch with the outside paper removed) all the way to the bottom, leaving about 1" sticking out the top. You can also insert a piece of Visco Safety Fuse, but the ignition delay will be longer. Let them dry for 3 to 4 days.

When lit, they will burn with a brilliant colored flame and shoot off in a random direction. Be very careful if you light one on the ground. It can launch in an unpredictable direction... and with its burning hot Magnesium flame, ignite whatever it lands on

---

Dragon's Eggs

from Passfire Discussion On How to Prime

(prime with melted paraffin wax)

the formula is under crackling microstars, credited to David Trimmel, I believe.

bismuth trioxide 37.5%
copper(II) oxide 37.5%
magnalium 25%

I use bismuth subcarbonate instead of bismuth trioxide, 1:1

Comments from posting (not LK comments): He says to bind with Winchester 231 double base(?) and amyl acetate. I used no amyl acetate, only 231 dissolved in acetone to spray consistency. They are impressive. I coated some with wax before priming, and they are even louder. I primed with KClO4 70%, MgAl 20%, red gum 10% (inner prime), then a hot BP outer prime. They seem to perform best with fairly thick primes, so they do tend to get bigger than you'd expect. But LOUD !

Editor's note: I have not had to use wax to get good results with this formula. Make sure that the layers of material are bound with different methods. The egg uses NC, so use a water binding for the prime. Use an NC or acetone/parlon binding for anything on top of the egg prime.

A web page has been made for this. See the index.

Alternative formula from AFN III

Bismuth Trioxide	81.8
Magnalium, granular, -100 mesh	9.1
Copper(II) Oxide, black	9.1

Dragon's Eggs from rec.pyro (Lloyd Sponenburgh Method)

A web page has been made from this. See the index.

Here's a re-preach from an earlier question:

The formula is no secret. The real secret to getting good crackle is just getting enough NC in the mix. You'll understand lower down in this email.

This formula has been circulating on the internet for years:

71 Bismuth trioxide
14 Black copper oxide
10 Magnalium (see notes)
5 fine atomized aluminum (-300 mesh, like Service Chemical "X-Fine")

The magnalium for "regular" crackle is 200-mesh. The coarser the magnalium mesh, the longer the delay between ignition and explosion. At 80-mesh, it's about three seconds, and pieces as large as ¼" will explode in a single explosion. The finer the magnalium, the smaller the pieces must be. At 200-mesh, 1/8" dia. stars are about as large as you can make them. Otherwise, they just spall small chunks, and
the body remains un-reacted.

The mixture is screened well, then mixed into a wet, sticky dough with 10% w/v nitrocellulose lacquer made from double-base powder (like Green Dot or Blue Dot or Bullseye shotshell powder).

There's a secret to making the lacquer that I've published over and over, and folks STILL think it takes a couple of days to make. In reality, it takes about 30-minutes.

Measure out the acetone in a vessel at least four times larger than the volume you're working with. I use a deep stainless steel mixing bowl from a kitchen mixer. With a kitchen whisk in your strong hand, and the weighed NC powder in the other, start slowly but uniformly pouring the powder into the acetone while you whisk your arm off. Mix FAST, and don't stop until the whole mass thickens up to about the consistency of heavy cream. Work lumps down off the sides of the bowl as you go. Don't _ever_ let any undissolved powder settle to the bottom.

Now, cover the bowl and let it sit for about 30 minutes. Come back and whisk again for about three or four minutes, and your lacquer is ready. You can ignore any "soft lumps"; they'll dissolve during the
kneading process. In another large, shallow bowl, "crater" your crackle mix, and start adding NC lacquer, a little at a time - just like making bread dough.

Knead it thoroughly. At first, it will become "mealy" like making pie dough. As you add more NC, it will become more and more dough-like. Knead it until it's perfectly smooth and homogenous, and quite a bit
on the sticky side of too wet. It should end up almost impossible to knead properly any more because it's too sticky to handle. It should be about the consistency of a very thick batter, rather than a dough.

This is hard work. Wear stout rubber gloves. Scrape your gloves down into the wet mix to get the dried chunks

back into the mass. I know this might sound silly, but DON'T allow sweat to drip into the dough… don't. (you will be sweating)

It's important to the loudness of the crackle to get enough NC in there. If the dough ends up too sticky to handle, that's OK… Just mush it out flat and let it dry a little. As it dries (and it dries pretty fast) it will lose its stickyness. Keep working the wet mass until it returns to the consistency of a stiff dough.

Once the dough is back to the right consistency, more "push" than "scrape" it through standard ¼" hardware cloth onto trays lined with paper. You'll get ¼" "worms" about two inches long or less. Don't layer them more than a couple deep, or they'll all stick together. If they do, let them dry a little, knead them back into a lump, and repeat.

Let them dry slowly in the shade without molesting them JUST until you can "diaper" the mass without having the worms stick to one-another. The goal is to get them partially dry, but not so dry you cannot further process them for smaller grains.

Now, working with a small amount at a time, push these worms through 6-mesh screening. 6-mesh gives 1/8" stars. Especially now, don't layer the mass; you must keep the stars from adhering to one-another.

As they dry a little more (the "knack" part comes now), put them back in the 6-mesh screen, and gently ROLL them back through the screen with the flat of your gloved palm. Avoid scraping or pushing straight down. What you're doing is basically rounding off the chunks and forcing them to size in one operation.

Let these stars dry thoroughly, occasionally diapering the mass to get damp ones to the surface. In the sun, they should dry completely in an hour or so. You should detect no acetone odor, but you will smell a "sharp" odor from the nitroglycerine in the NC lacquer.

Finally, re-screen the entire mass to remove chunks larger than 6- mesh, and sift out any "fines" smaller than about 10-mesh. The big pieces and the fines may be re-processed later simply by adding acetone and re-kneading. You can make really small stars for crackling gerbs with the -10+20 pieces, if you wish.

Now, prime them. Make up a saturated solution of potassium dichromate as your rolling solvent. DO NOT USE plain water - the stars will react with water, and can actually ignite from the heat.

Start a fairly large mass of the dried stars rolling in your star roller. They must tumble freely. They're so heavy that a small mass will just slip around in the drum. In fact, they may not tumble at all until you start to dampen them with solvent (gives a little "bite" on the surface of the drum).

Wet them with the solvent until they glisten, but still tumble freely. Lay on a layer of simple rough-mix powder (75/15/10 +7% dextrin). Do not mill this… you want it coarse; just mix it by screening repeatedly through 20-mesh. Just like star rolling, add dry mix until they'll not take up any more, but try to keep the layer

smooth, without excess dry mix in the mass.

Do only a couple of layers. The goal is NOT to build them up in size, but just to evenly coat all surfaces of each grain. There shouldn't be any grey crackle showing, but the grains should be only marginally larger than when you started. Finish up with a large excess of dry powder to make the grains' surfaces "dusty" for easier ignition. Uniform ignition over the entire surface of the star is part of the secret to getting it LOUD.

Dry these again in the sun and gently sift out the excess priming mix, and you're done - with straight crackle.

Add up to 10% by weight of fine titanium sponge or flake to the original mixture (60-100 mesh) to get the "brocade" burst effect.

Around five pounds per batch is about as much as one person can handle comfortably at one time.

Although this sounds like more work than making cut stars, it's lots faster, and turns out a good product. Even for cut stars, you have to do everything but the screening phases, and cutting uniform 1/8" stars
is difficult.

Once you've made five _finished_ pounds of these, call me up, and we'll get you some therapy for your arms.

Let me know when you've achieved a forty pound day!

And yet another formula. If you start using the dragon's eggs formula and aren't quite satisfied, try adding a bit of dark aluminum to the mix. Lloyd has often pointed out the the aluminum content can affect the price of eggs. ;-}

Bismuth Subcarbonate 75
Magnalium, granular, -200 mesh 15
Copper(II) Oxide, black 10
Aluminum, atom, spher, 120-325 mesh, 20 micron 5

And Again:

bismuth trioxide 55
Copper Oxide 25
Magnalium 60 - 80 mesh 20
NC 12

"Safe" flash powder

This burns slowly when not confined but explosively when confined.

This is patented, see: http://www.google.com/patents?vid=US...hnic+Explosive

Potassium Perchlorate 72.0
Terephthalic Acid 17.3 (common)
Magnalium 10.7

Potassium Perchlorate 73.2
Pentaerythritol 17.9 (probably unobtainium for most pyros)
Aluminum Powder 8.9

Mix in 2% Nitrocellulose Lacquer to form a "damp powder" and allow to dry

Sparklers

	A (T. L. Davis)	B (Allen F. Clark)	C (unknown, from T.L. Davis)
Potassium Nitrate	-	64	-
Potassium Perchlorate	-	-	6
Barium Nitrate	48	30	-
Finely powdered aluminum	7	9	1
Fine iron filings	24	-	12
Sulfur	-	16	-
Charcoal dust	-	16	-
Manganese dioxide	2	-	-
Antimony Sulfide	-	16	-
Dextrine	12	16	2

Add sufficient water to make a thick "paint" and dip the 18 gauge iron wires several times, drying between dips. Be careful of these as they are extremely fast burning in powdered form.

Source: John Reilly on rec.pyrotechnics

Morning Glory Compositions

(make from epoxy, jab a straw into them until full, let set, light) - thanks to Dan T.

Ammonium perchlorate is the oxidizer.
The epoxy is 15-30 minute pot life.

Ti 15% 40-200 mesh

Epoxy 16%
AP 69% 200 micron

Cast Iron 25% (like brake turnings)
Epoxy 14%
AP 61% 200 micron

Strontium Carbonate 9%
Epoxy 16%
AP 75% 200 micron

Crackling Flowers (source Harold Plumber on Passfire)

The secret of success is to prepare the smoldering composition in such a way that it creates a glowing melt that protects the Ti flakes from reacting with the atmospheric oxygen. When the heat from the melt ignites the crackling core, the molten star bursts and the hot Ti flakes ignites in the air, creating the Dandelion ball.

I have no specific formulas for this type of effect, but I do know that smoldering compositions are easily made from overloading glitter compositions with sulfur!"

Since then, I have met and spoke to a Japanese pyrotechnist who explained the effect in more detail:

The Japanese call them Crackling Flower Stars to distinguish them from ordinary Crackling Stars.

The star contains a crackling star core made from either a traditional lead based composition:

46 Lead Tetroxide
16 Lead Dioxide
16 Copper oxide
22 Magnalium (200 mesh)

or a bismuth based composition:

30 Bismuth Oxide
40 Copper Oxide
30 Magnalium

In both cases the crackling core compositions are wetted with NC lacquer and granulated through a 8 mesh sieve twice. After drying the bigger granules are separated from the finer on a 10 mesh sieve and the result should be granules about 2-2.5 mm.

The cores are then coated with a special prime:

70 Potassium perchlorate

12 Red Gum
5 Potassium Dichromate
3 Magnalium (200 mesh)
10 Silicon powder (200 mesh)

A titanium spark composition is then added by rolling the crackling cores with the following composition (NC lacquer is used as binding system):

34 Potassium nitrate
6 Sulphur
5 Antimony trisulphide
15 Pine Charcoal
20 Titanium
20 Resin

The resin was not specified but I guess it is red gum or some synthetic resin of phenolic kind.

Everything above was published in the proceedings of the 8th International Symposium on Fireworks!

Edit:
I forgot to add that Mr. Sashimura believed that substituting the Ti for coarse MgAl could produce an even better and louder effect since coarse particles of MgAl burn with a crackling noise of their own!

Slow Flash Discussion

Slow flash is used for break for shells. Ned G. uses 2-1-1 (potassium nitrate, sulfur, dark aluminum) dusted onto rice hulls. Depending on the kind of dark aluminum, the slow flash can be quite fast and might be too harsh. For instance, Eckhart 5413H makes a very hot slow flash which is almost unusable as a breaking charge except on small shells.

An alternative was offered by Eric H. which tempers the flash and gives good ignitability:

Here is the formula we used for production for many years.

Potassium Nitrate 31
Barium Nitrate 31
Aluminum 19
Sulfur 12
Antimony Trisulfide 7

Robert W. also cited using Ned G.'s formula and Eckhart 5413H but using 1/2 barium nitrate and 1/2 potassium nitrate.

Potassium Hydrogen Terepthalate

To make potassium hydrogen terepthalate: dissolve 6.9 grams of potassium carbonate in water. Add 16.6g of terephthalic acid and let it react. Filter.