Primers made with FA-70 compound.

Here are the steps for making FA-70 primers, the danielD's modified version. Marshall Thompson I borrowed your word template to make this in the same format, as some of methods of H-48 are applicable:

Centrefire Primers:

Materials needed: a) Potassium Chlorate, b) Antimony Trisulfide, c) Pistol smokeless powder, d) Finely ground glass - preferably borosilicate mesh 300 (this is used to help grind smokeless, e) Lead Thiocyanate or Copper Thiocyanate, f) Scale that weighs in grains, g) Paper disks punched out of tobacco rolling paper that will fit inside the primer cup, h) Gum solution, I) individual mesh screens 140 mesh x4, 300 mesh x 1, J) Numerous fine paintbrushes for moving components through mesh and mixing.

1. Using 4 plastic weigh boats and a suitable scale, weight out the following materials:

    a. Boat 1, 17.49 grains (53%) of Potassium Chlorate ($KCLO_3$) 140+ mesh,

    b. Boat 2, 5.61 grains (17%) of Antimony Trisulfide ($SB2S_3$) 140+ mesh,

    c. Boat 3, 1.65 grains (5%) of Pistol (fast burning) Smokeless Powder 140+ mesh (there will be a small percentage of 300 mesh glass in that 5% due to the process of grinding smokeless powder),

    d. Boat 4, 8.25 grains (25%) of Lead Thiocyanate PB(SCN)2 140+ mesh (can be substituted for Copper Thiocyanate)

2. Put ingredients “b”, “c”, and “d” on a plain A4 sheet of paper and mix thoroughly using a fine paintbrush. The pile of powder may also be rolled back and forth on the paper (diaper method) to aid in blending the ingredients. These ingredients (and only these ingredients) are safe to mix together without special precautions. ***IMPORTANT: DO NOT ADD ingredient “a” until instructed below***

3. Collect the thoroughly mixed powder from above into a single pile by lifting up the edges of the sheet. Now pour ingredient “a” into a separate pile on a clean area of the sheet that is beside but not contacting the previous pile. Using a fine paintbrush, crush any lumps in ingredient “a” and make a smooth free flowing powder. DO NOT MIX ingredient “a” with the other ingredients until this crushing step is completed.

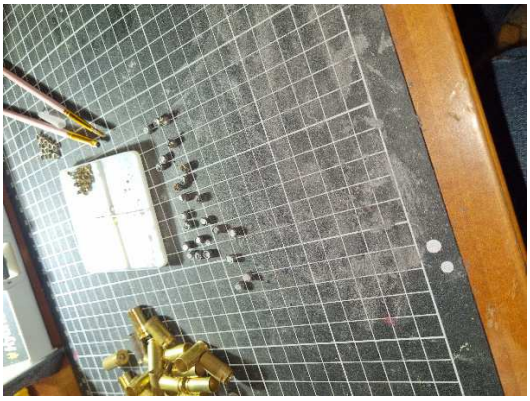
4. Now, lift up the edges of the paper sheet and roll the two piles of powder into one another. Once these powders are combined, the mixture becomes explosive so be very careful to avoid sparks or any rapid crushing action. Using only this rolling action on the paper sheet, continue to mix the powders until a homogeneous mixture is formed. The use of a fine paintbrush can be used to gently breakup any agglomerated lumps of powder that are found during this blending step.

5. Run combined mixture through 100+ mesh screen three times, use paintbrush to aid in moving through. Aim away from face, consider face shield, as this is now a sensitive mix.

6. The final result is 33 grains of dark gray powder that is FA-70 primer compound (light grey if using Copper Thiocyanate). It may be stored in a small plastic condiment cup with a snap on cap until ready for use.

7. Position 10-25 prepared primer cups (dimple removed and of the same brand of cup and anvil) onto loading tray of choice. Take container of FA-70 priming compound and add a couple of drops of gum solution. Kneed with nitrile gloves like dough, add more gum until it becomes like black tooth paste, smear into cups, filling them, repeat the operation until all of the cups are filled.

8. Place a rolling paper disk/foil (cut with punch tool) over the wet FA-70 compound in each cup, then place the anvil on top.



9. Press anvil flush down with either the flat end of the hammer or an arbour press. It will take almost no force as the compound is wet.

10. Clean excess primer compound material off the primer cup with a rag.

11. Load immediately in cases and then Dehydrate or Dehydrate and load primers into cases once dry. Dehydration must be at 45_c for 36 hours and then at 50_c for a remaining 5 hours.

12. Completed FA-70 primers have the same stability/sensitivity/energetics as standard commercial primers.
13. The cost of making FA-70 primers has yet to be calculated.

Notes:

- Copper Thiocyanate is cheaper to use, has the same effect and does not require lead nitrate. You only require a donor Thiocyanate (Ammoniu or Potassium Thiocyanate),

  Copper sulphate $CuSO_4$ (hardware store), and Sodium Metabisulfite $Na_2S_2O_5$ (sodium

  Bisulfite $NaHSO_3$) (ebay). Both of these are cheap as chips and readily available anytime,

  unlike Lead nitrate $Pb(NO_3)_2$. Further testing is till required, but early tests prove Copper

  Thiocyanate has the same energetics. There is also almost no residue on cases after Copper Thiocyanate is fired.

Possible ideas that need to be tested with FA-70:

- Removal of Antimony Trisulfide from mixture, allegedly removal has little impact on the formula?
- Replacement of Antimony Trisulfide with much easier/cheaper to obtain iron sulphides?

Rimfire FA-70:

Same formula as centrefire (Both the Copper and Lead Thiocyante versions work just as well). The only difference is that it is not wet loaded.

- Once fired 22LR or 22Mag cases are wet tumbled with steel pins for cleaning.
- Dried and cleaned cases are placed into a suitable case holder (refer to pic).
- Rimmed cases internal rim pocket are cleaned with suitable tool (refer tool pic) and residue tapped out by turning upside down on table. This only requires one full turn as the wet tumble will most likely have removed everything.
- Place 13/64 drill bit (cut flat end) in and with hammer tap it once down to provide a little more room at rim for compound to enter.
- Ingredients once mixed, are dropped into the case dry (one SPP primer cap full, you can use two caps if you wish to increase energetics to commercial level, I hot-glued an empty primer cup to one end of a fine paintbrush as a scoop).
- 13/64 drill bit cut flat end (which has had one end cut flat, and the chuck end ground with a slight rounded edge), is inserted and turned anti clockwise several times. This forces the

priming compound into the rim. Then the rounded end is inserted, and a little force used to tamp/compress the mix.

- Then one drop of gum solution from a pippet eye dropper is applied dropping straight down into case.

- Dehydration process is the same as the centrefire primers.

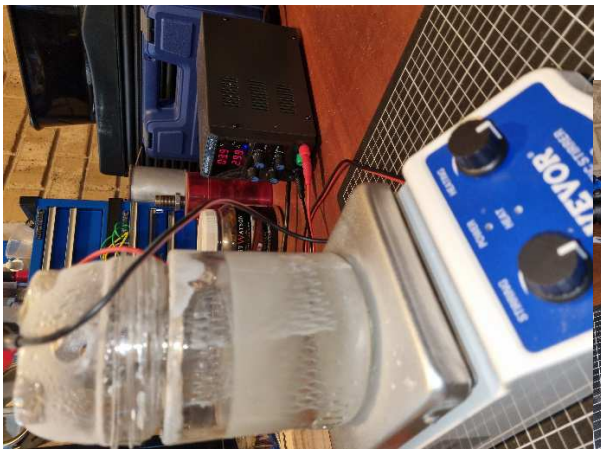
Please note that when turning drill bit anti-clockwise you may experience the dry compound igniting due to friction (this is especially true when Copper Thiocyanate is used). Always wear thick gloves and eye protection during this stage, gloves are for accidental combustion, and to stop the sharp edges of the drill bit cutting you.

Synthesizing potassium chlorate:

Using Electrolysis:

1. Create an electrolysis chamber (must have a vent hole). Something that can suspend two platinum coated titanium plates in a liquid solution. Refer to pictures.

2. Make up a solution of 33 grams of potassium chloride/100mls of distilled water.
3. Attach a variable DC power supply to both anode and cathode.
4. Apply 3 Amps of current and approximately 3-6 volts (lots of variable here dependant on size of plates, how long it has been running, concentration of solution etc.) Keeping the amps constant is the most important thing for the life of your plates. Refer to pictures.




5. Leave to run overnight, you will begin to see crystals forming on the bottom. Let it run until the crystals start covering your plates (Probably a couple of days) Turn off the power supply.
6. Decant liquid and filter crystals in vacuum filter, wash twice with ice cold distilled water. Keep solution for the next run as it will give you a head start on the reaction.

7. Keep in mind that as the reaction is occurring it is forming Toxic Chlorine gas on one plate and Hydrogen gas on the other plate. Perform in well ventilated area away from sparks.
8. Dehydrate until completely dry.
9. Grind in Glass mortar and pedestal (140+ mesh) so that no organic contaminants enter, which could cause decomposition over time. Store in plastic, not glass (in case of an explosive decomposition) away from light and heat and moisture and any organic or metal compounds that could contaminate.

10. Take small sample of created Potassium Chlorate mix 50 to 50 with white sugar and ignite with flame torch. It should burn with a purple colour. Purple signifies a pure product.

From Bleach:

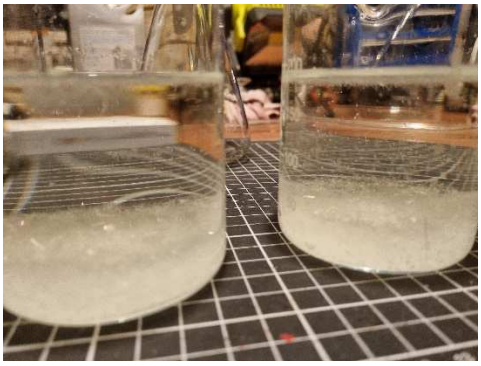
1. 500mls of the strongest concentration bleach 12.5% (sodium hypochlorite) that you can find is brought to boil on hot plate. Keep at a medium boil until you can clearly see that the sodium chloride (salt) has separated and left a sodium chlorate solution. Should be about an hour. Do this outside as chlorine gas is released and is extremely toxic.

2. Filter off the sodium chloride (discard it) leaving behind a liquid solution of Sodium Chlorate. Approximately 200mls of solution.

3. Take it off the hot plate and let it cool. While you perform the next step.

4. Add 75 grams of Potassium Chloride to a solution of 200mls of distilled water. Stir on hot plate until all dissolved.

5. Pour Potassium Chloride into the Sodium Chlorate solution. An exchange will occur and form Potassium Chlorate and sodium chloride.
6. Place in the fridge, and as it cools the saturated solution of Potassium chlorate will form crystals on the bottom leaving the sodium chloride dissolved in the liquid.



7. Decant off liquid and discard.
8. Vacuum filter and wash with icy cold distilled water twice.

9. Dehydrate until completely dry.

10. Grind in Glass mortar and pedestal (140+ mesh) so that no organic contaminants enter, which could cause decomposition over time. Store in plastic, not glass (in case of an explosive decomposition) away from light and heat and moisture and any organic or metal compounds that could contaminate.

11. Take small sample of created Potassium Chlorate mix 50 to 50 with white sugar and ignite with flame torch. It should burn with a purple colour. Purple signifies a pure product.

Synthesizing Lead Thiocyanate:

Ingredients required:

1. Ammonium Thiocyanate 23 grams dissolve in 60 millilitres of distilled water.
2. Lead nitrate 50 grams dissolve in 150 millilitres of distilled water.

Process:

1. After dissolving each ingredient in its respective beakers place on ice bath. Refer to picture.
2. Wait until temp drops to 5 degrees Celsius or below (important for faster reaction and finer smaller crystals).

3. Drop Ammonium Thiocyanate into Lead nitrate with eye dropped or syringe slowly while stirring (important for faster reaction and finer smaller crystals). Refer to video.

4. Once finished with the addition, let it sit there so that the Lead Thyicyante can fall to the bottom and separate from the now Ammonium nitrate solution.

5. Decant Ammonium nitrate solution and store for further experiments.

6. Filter and wash Lead Thiocyanate with ice cold water once or twice in vacuum filter.
7. Wash once with 100% isopropyl alcohol and vacuum filter again to remove as much liquid as possible.

8. Dry in dehydrator in the dark until it turns to powder.
9. If the addition of the Ammonium Thiocyanate is added slowly enough to the lead nitrate, and if the temp is kept under 5 degrees, the mesh size of the Lead Thiocyanate will already be at 140+ mesh.

Synthesizing Copper Thiocyanate:

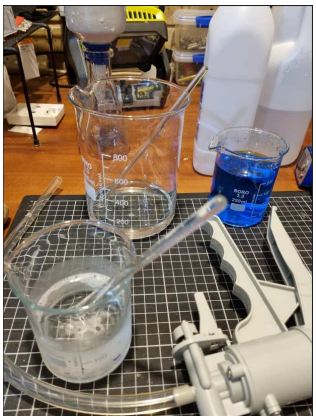
Ingredients required:

1. Ammonium Thiocyanate 50 grams dissolve in 100 millilitres of distilled water.
2. Copper Sulphate 50 grams dissolve in 200 millilitres of distilled water.

3. Sodium Metabisulfite 25 grams dissolve in 100 millilitres of distilled water.

Process:

4. After dissolving each ingredient in its respective beakers,



(blue is copper sulphate, small amount of liquid is sodium metabisulfite, and liquid that has dropped in temp and has a frost on beaker is ammonium thiocyanate)

5. Combine the Copper sulphate and Sodium metabisulfite liquids together.

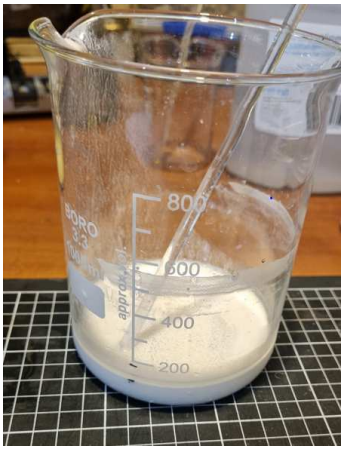
(Copper sulphate has now turned green with the addition of sodium metabisulfite)

6. Place both the Ammonium Thiocyanate and the combined copper and sodium liquids on ice bath. Refer to picture.
7. Wait until temp drops to 5 degrees Celsius or below (important for faster reaction and finer smaller crystals).

8. Drop Ammonium Thiocyanate into the combined Copper and Sodium mixture with eye dropped or syringe slowly while stirring (important for faster reaction and finer smaller crystals). Refer to video.

9. Once finished with the addition, let it sit there so that the newly created Copper Thiocyanate can fall to the bottom and separate from the now Ammonium Sulphate solution.

10. Decant Ammonium Sulphate solution and store for further experiments.



11. Filter and wash Copper Thiocyanate with ice cold water once or twice in vacuum filter.
12. Wash once with 100% isopropyl alcohol and vacuum filter again to remove as much liquid as possible.

13. Dry in dehydrator in the dark until it turns to powder.

14. If the addition of the Ammonium Thiocyanate is added slowly enough to the Copper Sulphate, and if the temp is kept under 5 degrees, the mesh size of the Copper Thiocyanate will already be at 140+ mesh.

Grinding borosilicate glass the easy way:

Purchase the 1.5ml borosilicate glass vials. They are so thin they are easy to crush. Use stainless steel mortar and pedestal to grind until it's a fine powder. Check on mesh until it reaches 300 mesh. Should take 10 minutes to reach that mesh level.

Grinding smokeless powder the easy way:

Add a pinch of glass to a small amount of smokeless powder. Grind in stainless steel mortar and pedestal. Will take about 25 minutes to reach 140+ mesh.

Determining mesh levels of powders:

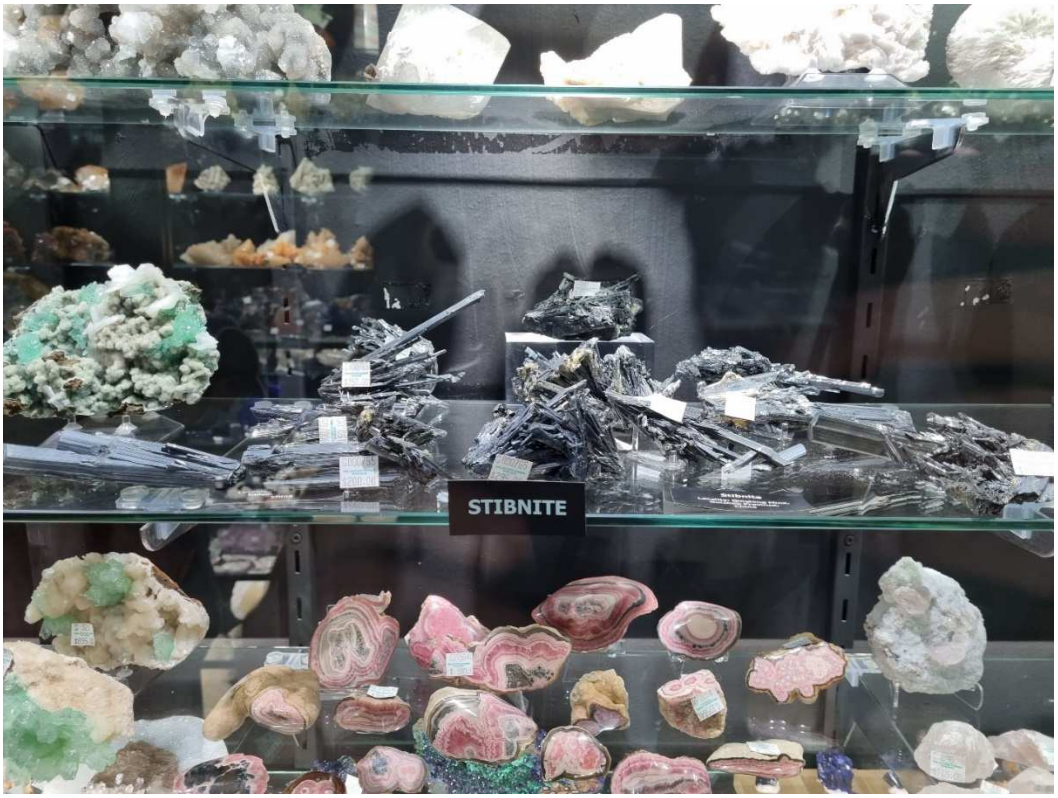
Purchase the mesh screens from ebay. Seller in china is the only one that sells the 20cm plastic mesh screen pots. Which will never contaminate or react with any of your chemicals (unlike metal). Use paintbrush to force through. Regrind if it does not go through. Pictures attached.

Obtaining antimony trisulfide and processing:

Purchase Stibnite Crystals from Gem stores online or in person. Samples are usually contaminated with another mineral at the base, as they grow in conjunction with other minerals, so choosing a good sample that has as little other minerals growing off it is key.

Equal importance is choosing a sample that is of the purest form, which can be determined by the colour and the shape and structure of the crystals. They should be long, slender prismatic needle like crystals (refer picture).

Take a pair of plyers and break off some of the pure mineral (black shiney, crystalline appearance) into a zip lock bag, as it is very crumbly and will go everywhere. It is extremely soft and not much force will be required to break off. Then crush in mortar and pedestal until at the correct mesh size (140+ mesh). Make sure to wear a respirator and gloves as it is extremely toxic to skin and lungs.



Making gum solution:

Ingredients required:

1. Distilled water 800 millilitres
2. Gum Tragacanth 10 grams
3. Gum Arabic 5 grams
4. Gelatine 1 gram
5. Thymol 0.15 grams

Tools required:

1. Magnetic Stirring hot plate
2. Glass stirring rod
3. 1lt Glass beaker
4. Cheesecloth
5. Storage glass bottle.

Procedure:

1. Add both gums to water while stirring.
2. Heat mixture to between 70-75 degrees Celsius. Maintain temp for three hours.
3. Cool to room temperature.
4. Dissolve Thymol in 15 grams of 100% alcohol.
5. Add dissolved thymol to gum mixture while continuing to stir.
6. Strain through cheesecloth and collect in stoppered bottles.
7. Shelf life is two weeks unrefrigerated.
8. Shelf life refrigerated is unknown.


Final Case notes and reflection:

- Always clean firearm after firing this corrosive primer recipe. Potassium chlorate on decomposition (firing/igniting) forms Chlorine dioxide gas, which leaves chlorine residue on the barrel, which is corrosive if not cleaned that day.
- Residue from firing is white in colour when using Lead thiocyanate.
- Residue from firing when using Copper thiocyanate is either unnoticeable or sometimes has a green tinge.
- Unlike H-48, FA-70 should be stable for long periods of time and will not suffer from issues with moisture contaminating the Sulphur.
- An important part of the process is the ingredients being of fine enough mesh. Interesting to note - it seems that increasing mesh past 150 had no effect on sensitivity.
- The second most important part of the process is the wet loading. The Potassium chlorate dissolves in the gum binder, and recrystalises out into tiny fine crystals, interlocking and

intimately mixing with all the other ingredients in a consistent manner, therefore increasing its sensitivity, and reliability.

- Main reaction is between the Potassium Chlorate and the Lead Thiocyanate, the smokeless powder play a major role in sensitivity, and the antimony Trisulfides real role is still a bit of a mystery?
- FA-70 was used predominantly during WW2 with great success, in all munitions.
- FA-70 does not require the purchase of hard to obtain/restricted chemicals for those parts of the world where Sodium Hypophosphite is restricted. Everything can be obtained or created easily.
- Thank you to everyone on this amazing group for giving me the information and knowledge, to be able to compile all this together!