

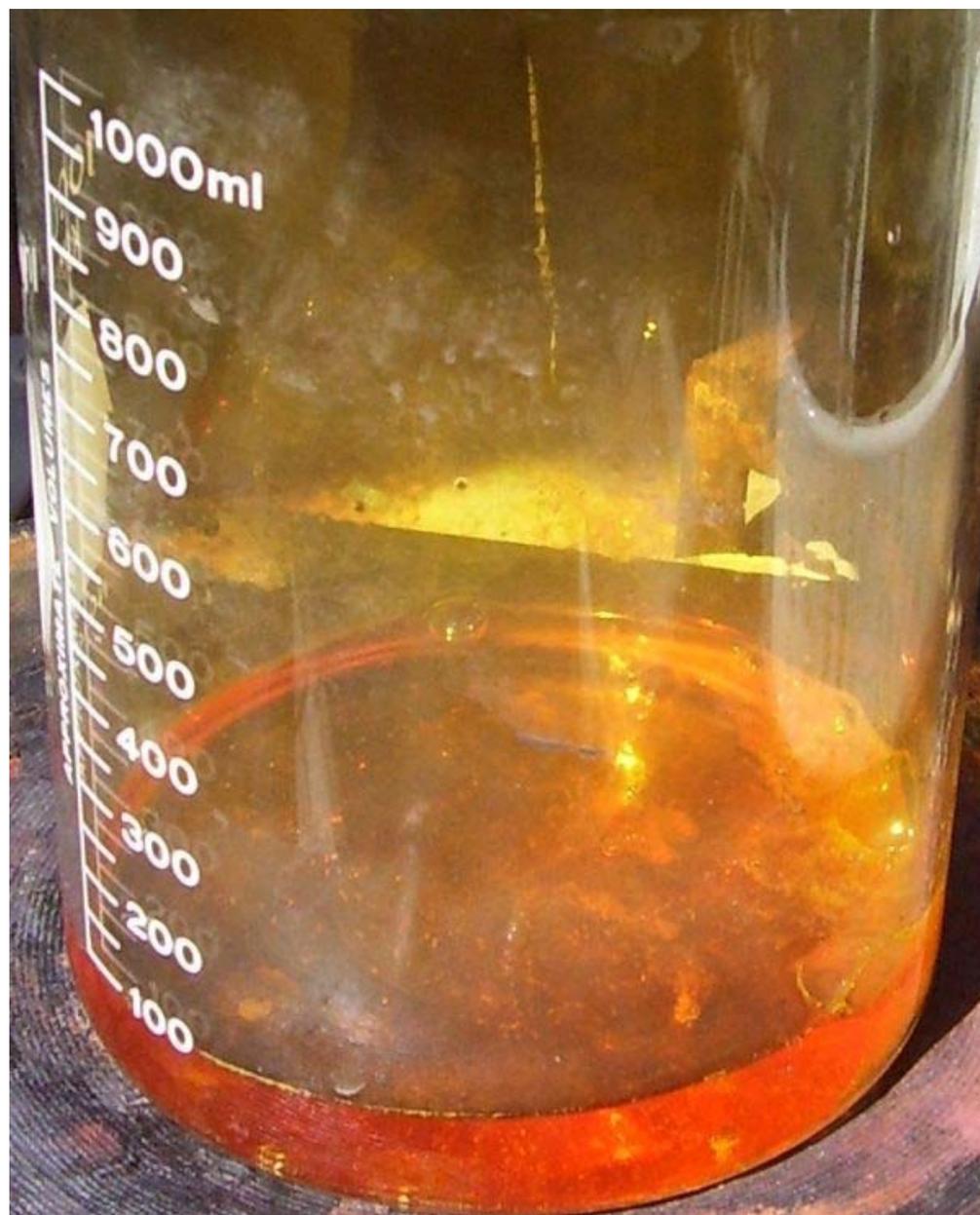
All,

There seems to be a lot of confusion on the various acid mixtures used in the different reactions. I've put together this quick list of reaction mixes. I know it's incomplete so I'll be adding to this list soon.

Here's a quick reaction list:



1. AR= Aqua Regia = 1 part 70% Nitric Acid, 3 parts Muriatic Acid (some guys use 4 parts muriatic). Used to dissolve high karat gold, gold powder, gold foils, dissolves Platinum when hot. Excess nitric must be evaporated off or neutralized with Urea to pH 1 +/- 0.4, then drop gold with SMB.
 - o Hoke states 4 fluid ounces HCl + 1 fluid ounce HNO₃ dissolves 1 troy ounce gold. This is equivalent to 3.8 mL HCl + .95 mL HNO₃ per gram of gold.



2. AR Recipe 2= Poor Man's AR = 8 oz Sodium Nitrate (aka Subzero), 480 ml water, 960 ml Muriatic Acid plus heat. Used to dissolve high karat gold, gold powder, gold foils, dissolves Platinum when hot. Excess nitric must be evaporated off neutralized with Urea to pH 1 +/- 0.4, then drop gold with SMB.
 - o The above mentioned recipe makes enough AR to dissolve 160 gm Pins or 32 oz of ceramic cpus.





3. HCl-Cl= Clorox Method = 4 Parts Muriatic, 1 Part Clorox (added in small increments). Used to dissolve gold foils and powder. Drop gold with SMB, NO urea needed.



4. AP= Acid Peroxide = 2 Parts Muriatic Acid, 1 Part 3% Hydrogen Peroxide. Dissolves base metals, slowly dissolves gold when heated. If gold is present drop with SMB, NO urea needed. An even better method of precipitating dissolved gold is to continue using the solution until it becomes saturated with copper, then the gold precipitates as fine black powder.

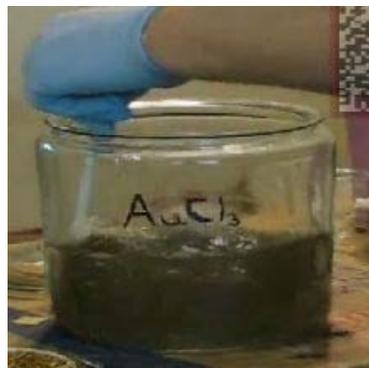


5. Dilute HNO₃=Dilute Nitric Acid= 1 part water, 1 part 70% Nitric Acid. Used to inquart, dissolve base metals, dissolves palladium, and dissolves silver. Silver nitrate will stain skin blue which turns black in sunlight. Skin remains black for nearly 1 week.
- Hoke states 4-6 pounds of concentrated nitric acid dissolves 1 pound of base metals. 5 pounds of 70% nitric, 1.41 sp.gr. is 1610 mL ≈ 0.425 gallons. This equates to 1610 mL / 454 gm ≈ 3.55 mL per gram.
6. H₂SO₄= Sulfuric Acid = 1 cup 96%+ Sulfuric, 1/8 tsp glycerin (optional). Used as electrolyte in electrolytic cell along with a small amount of glycerin. Effective on medium to large gold plated items. With specially designed anodes and cathodes large batches of smaller plated items can be processed. Not used for Gold filled or karat jewelry.
- Use until acid is saturated with black powder typically 12-24 hours of operation. Sink any floating black powder, let settle overnight, pour off bulk of acid for reuse, and dilute remaining acid with 4 parts water.





7. HCl= Muriatic Acid = 31.45% Hydrochloric Acid. Used in the crockpot method and for general cleanup of gold foils and powders. Dissolves base metals. Also used in making stannous chloride gold testing solution.
8. SMB= Sodium Meta Bisulfite (aka Storm Precipitant) plus water=28.3 Grams Sodium Meta Bisulfite, 240 ml H₂O. Used to drop gold from gold bearing solutions.
 - Add 65 grams to 100 ml water for saturated solution. Add to pregnant solution until stannous chloride test on solution is negative for gold.



Here's a procedure that can be used to clean and dry the resulting gold powder:

[Cleaning and drying Gold Powder](#)

[Details of Gold Drying process](#)

9. AuCl_3 = Auric Chloride= Term used to describe gold dissolved into solution. Typically imparts a golden yellow color to solutions. Stains skin and other organics purple.



10. SnCl_2 = Stannous Chloride= Used to test solutions for precious metals. Made by dissolving metallic tin in hot muriatic acid. Loses strength when stored. Made by adding 1-2 grams of powdered tin to 30 mL of HCl. Heat until fizzing starts. A little extra undissolved tin powder helps the solution keep for longer. Keep air out of container when stored to extend life. Positive color test as follows:

Purple/Black color is Gold in solution, the darker the spot the more Gold.

Yellow/Brown that turns to Blue-Green after 30 seconds indicates Palladium in solution, the darker the spot the more Palladium.

Orange/Brown color is Platinum in solution, the darker the spot the more Platinum.



Stannous can be used to test for Rhodium in solution as described here:

Rhodium Test

11. $(\text{NH}_2)_2\text{CO}$ = Urea= 8 oz Urea, 480 mL Water. Used to neutralize excess nitric acid in AR process before dropping gold with SMB. Add until solution doesn't fizz and pH reaches 1 +/- 0.4.
12. AgCl = Silver Chloride= White precipitate that forms when silver is exposed to chlorine in solution. Turns purple in light, darkens further in sunlight. Solid by product of using AR on lower karat jewelry. Hazardous to melt due to fumes. Production of silver chloride should be avoided if possible. Can be converted to silver metal with lye and karo syrup or HCl and Al foil. Also can be converted using very dilute (10%) H_2SO_4 and an iron stirring rod. Do not let it dry out before conversion to silver metal.

For 1 tr.oz. of silver metal, about 41.5 grams of silver chloride, it takes about 20 grams of sodium

hydroxide, 13.3 mL of light Karo syrup, and 133 mL of water. (Thanks GSP!)



13. Inquartation= 3 parts base metal (Silver preferred) , 1 part Gold, Dissolved in hot dilute nitric acid. Powder/Honeycomb that remains is Gold and higher PGM's if present in source material. Left over liquid contains Silver, base metals, and Palladium if present in original alloy.
 - o Hoke states 4-6 pounds of concentrated nitric acid dissolves 1 pound of base metals. 5 pounds of 70% nitric, 1.41 sp.gr. is 1610 mL == 0.425 gallons. 1 gram of material requires $1610 / 454 \approx 3.55$ mL HNO_3 + 3.55 mL H_2O .

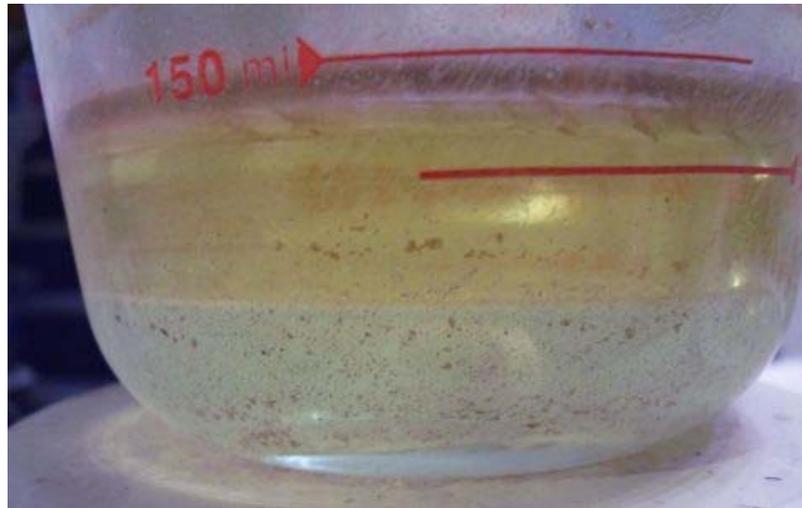
Inquarted gold before acid processing:



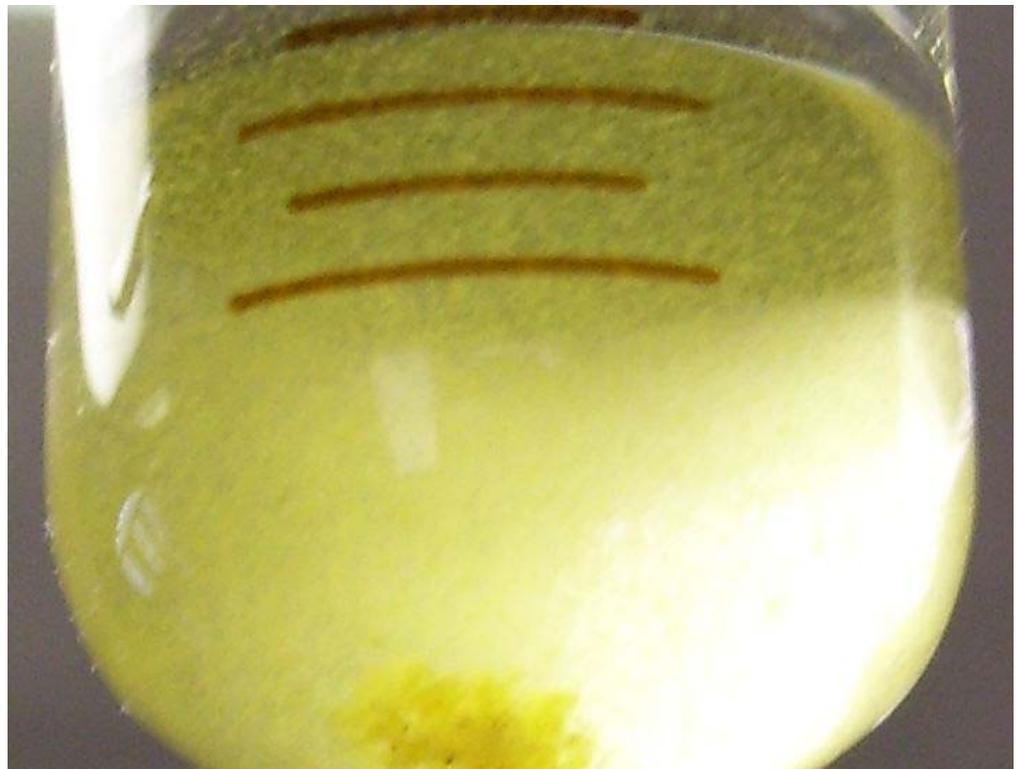


Properly inquired gold after acid treatment.

14. $C_{12}H_{26}O_3$ =BDG or DBC= Butyl DiGlyme or DiButyl Carbitol = Organic solvent that combines with Auric Chloride and is insoluble in water based solutions. Separates from water based solutions as an upper phase (layer). After washing with dilute HCl gold is dropped as flakes using Oxalic Acid. Can be used on AR solution without neutralizing excess nitric acid.

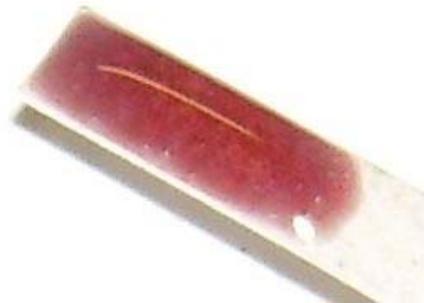


15. $CH_3C(OH)C(OH)CH_3$ =DMG or DimethylGlyoxime = Organic solid that combines with Palladium to form canary yellow crystals. Dissolve 1 gram in 25 mL of alcohol and add to 75 mL of hot water. Test with a single drop of DMG solution in a test tube sample of suspected palladium acid solution. In a minute or less you will see a yellow suspension of crystals if palladium is present.

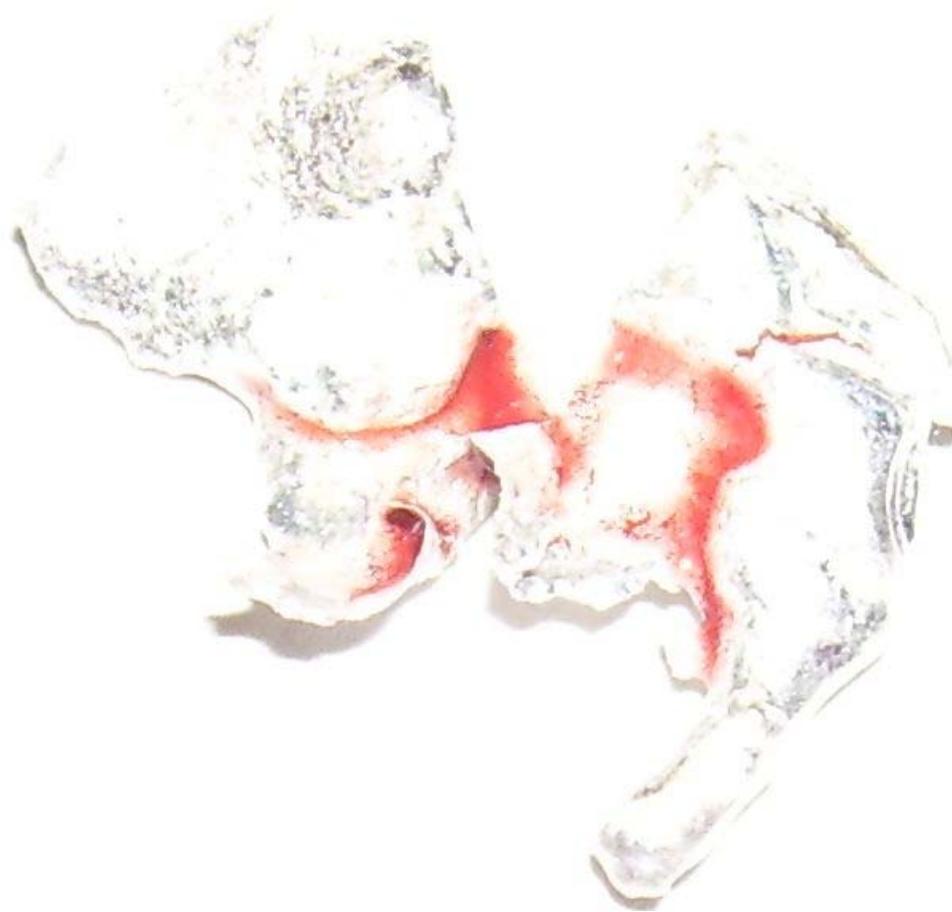


16. $\text{HNO}_3 + \text{K}_2\text{Cr}_2\text{O}_7$ =Schwerter's Silver Test Solution = Add 20 grains of potassium dichromate to 30 mL of 35% nitric acid. Test by applying a single drop to clean silver surface.

Here is a test on sterling silver:



and A test of Pure silver:



Here's an alternate method for making the silver test solution:

1. Dissolve Potassium Dichromate salt in 8mL of distilled water in a glass container. Add crystals until no more salt will dissolve in the liquid.
2. Add 25mL of 70% Nitric Acid
3. Store in a small bottle.

Testing with Schwerter's Solution

Testing with Schwerter's Solution

Apply a drop of Schwerter's Solution to the test piece.

The color reaction of the solution with the metal will be as follows:

Brass - Dark Brown

Copper - Brown

Nickel - Blue

Palladium - None

Gold - None

Silver Pure - Bright Red

Silver .925 - Dark Red

Silver .800 - Brown

Silver .500 - Green

Lead - Yellow

Tin - Yellow



This list is **not** all inclusive. There are many more methods to dissolve gold and base metals.

Steve