Instructions for SubZero Gold Refining Kit

No. **63.550**

The acid used in this process is muriatic (also known as hydrochloric) acid. This acid is very corrosive. For this reason, this kind of refining should be done outdoors or a well ventilated area away from anything that may be damaged by exposure to these fumes. Must be used in temeratures of 50º F or higher.

Having described it's hazards, it must be pointed out that, like most industrial processes, refining gold in acid is quite safe when performed under controlled conditions. In addition, the results of doing your own refining can be quite sweet. Based upon feedback we've gotten from several hundred shops, we estimate that, when refining just 10 ounces of scrap gold yourself, you will save about $800 over sending it out to be refined. On polishing sweeps, the return is generally increased by 3-10 times over sending the material out to be refined, with a return of about 1 ounce of gold from every pound of sweeps.

To refine gold with the SubZero Aqua Regia Refining Kit, you will need the following additional items:

- protective clothing--minimum requirement: goggles and rubber gloves
- muriatic or hydrochloric acid
- baking soda (sodium bicarbonate)
- tap water and distilled water

Melt your gold and make shot. Small open-up granules are best. If refining filigree or ladies rings, shotting is not necessary. Pour the shot into the beaker. For every ounce of scrap gold you are going to refine you will need a capacity of 300 milliliter. If refining polishing sweeps, see instruction on back page for preparation of polishing sweeps.

To the beaker, add 120 ml of muriatic (or hydrochloric) acid & 2 tablespoons of SubZero for every ounce of metal in the container. The metal will begin to fizz and give off an invisible or slightly brown fume. When the fizzing stops, then all the metal should be dissolved.

Pour the acid into another, larger container. ***Do not allow any particles to be poured off***. If any particles are poured off with the acid, they will contaminate your gold.

The acid will be a dark, emerald green color and should be clear (not murky or cloudy). If the acid is murky, it may contain particles and should be decanted again or filtered.

Add a pinch of urea to adjust the pH. If it fizzes, add some more until it no longer fizzes.

Add the 1fi tablespoons of Storm Precipitant for every ounce of dissolved metal. Immediately the acid will change to a muddy brown appearance as brown particles of gold form in the water. This brown "mud" is, despite its appearance, pure gold.

Give the precipitant about 30 minutes to do its job. Then test the acid for the presence of dissolved gold with Precious Metal Detection Liquid. Precious metal detection liquid will detect the presence of dissolved gold down to 4 parts of gold per million parts of acid) detecting the presence of about 1/1000th of 1 gram of dissolved gold. Testing for the presence of dissolved gold is absolutely necessary to insure that no dissolved gold is thrown away with the waste acid.

To test, first immerse the end of the stirring rod in the acid. Remove it and touch that end to a paper towel to make a wet spot. Put a drop of gold detection liquid on the wet spot on the paper towel. If any gold is still dissolved in the acid, the wet spot will turn a purple-black or a purple-brown. If you see this color change then give the precipitant more time to work and/or add more precipitant.

The acid should now be clear amber or a green color, with a brown mud at the bottom. Pour off the acid into another container. If you have a filter, you can use it. Do not pour off any of the mud. The mud is pure gold.

When all the acid is poured off, add tap water to the mud. Stir and let the mud settle. Pour off the water into the container with the acid. If you have a filter, you can use it. Do not pour off any particles of brown. Repeat this rinsing 3-4 times or more.

Test with aqua ammonia to insure high purity of your gold. Place a drop of aqua ammonia test liquid on the wet gold mud. If you see any change in color to blue, even a very pale blue, rinse and test again.

Give the mud a last rinse, this time with distilled water.

Put the beaker on a hot plate to dry the mud. Do not preheat the hot plate or thermal shock may cause the beaker to break.

Melt the dried mud (now a powder). If using a torch, first wrap the powder in tissue paper and then soak that in alcohol. Also, use a burno crucible. This will keep your gold from being blown away by the gas pressure from the torch. The gold will again take on the appearance of metal. If you've followed the instructions carefully, the gold will be 99.95 % pure with virtually no losses.

Platinum- If you had platinum in your gold, it will not dissolve, to any appreciable degree, in the room temperature aqua regia. It will be left behind when you pour off the aqua regia, prior to precipitation. To insure high purity of the platinum, you will need to re-refine this material. Alloy the platinum with 4 parts of nickel or cobalt. Pour into shot. Put this material in a fresh aqua regia bath. This time, however, heat the acid to simmering. Continue heating until all the platinum is dissolved (that may take 2-4 hours). When completely dissolved at 1 ounce of ammonium chloride for every ounce of dissolved platinum. The platinum will precipitate as a red mud. If you want to leave the iridium in the platinum, then wait for it to precipitate before recovering the platinum. Iridium will precipitate as a blue-black mud after the platinum precipitates. Platinum group metals will also show up on the stannous chloride test. Platinum turns red; palladium turns orange and iridium turn blue-black.

Reducing Polishing Sweeps to Metal (Burnout Method)

Standard methods of sweeps burnout are ineffective and produce a product similar in appearance to lava rock, and which is more, rather than less, difficult to refine. The following method requires about the same amount of work as ineffective methods but reduces to sweeps to a material that can be melted to obtain a bar of metal.

Polishing sweeps are composed of grease (the binder in polishing compound), sandy grit (the active ingredient in polishing compound), lint (from the buffs) and very tiny balls of karat gold (from the gold that was polished). Sometimes it will also include paper and buffs.

The first step is to remove all organic material. Take the dust and put it in a series of casserole dishes. The dust must not be more than 1" high and it must not be packed into place. This is very important. If sufficient air does not reach the sweeps, they will not bum completely. If there are buffs and large amounts of paper, these must be put aside for a separate burning.

Place the casserole dishes in your burnout oven. You can stack them, but make sure that there is sufficient space for air to freely circulate through them. If using an electric burnout oven, the door must be left slightly ajar so that sufficient air enters the oven.

Burnout at 13500 F until it has stopped smoking and an additional hour has passed. When it has cooled and you examine the sweeps, you should observe no blackness and no lumps. Typically, it is a uniform, light gray, fine sand. When examined until a loupe, you will find tiny balls of gold scattered in the sand.

If you attempt to melt at this point, the sand will tum to glass and its sheer volume will overwhelm the and microencapsulate the gold (you'll get a lump of black glass will little beads of gold throughout it). To avoid this, you must first remove most of the sand. This is done with lye (also called sodium hydroxide or caustic soda).

Lye is very corrosive, so take the normal precautions that you would take with any corrosive material (wear rubber gloves, eye protection etc.) Make a saturated lye solution by adding just enough water to the lye to cause it all to dissolve. Lye gets hot when you add water, so use cold water. Now, for every cup of polishing sweeps, add 10 cups of lye/water solution. Heat the solution to about 2000 F for about 1-2 hours in a stainless pot (do not use aluminum or any other metal- the lye will rapidly corrode aluminum).

Allow to cool to about room temperature and then carefully pour off the lye/water, being careful not to pour off the gold particles in the bottom. Rinse by filling the pot with fresh water, allowing the gold to settle and then pouring off the water. There will still be a lot of sand but it will not longer be overwhelming. The gold will be visible. Dry by placing the pot back on the hot plate at low temperature.

If melting by torch, first wrap it tissue paper and soak in alcohol. Use a partially covered crucible such as a Burno crucible or a casting crucible. These steps will help prevent the gold dust from being blow about by the torch.

The resultant gold bar may now be refined either in-house or it may be drilled for assay and then sent out to be refined by professional refiners.

Typical return of gold is 1 ounce per pound of polishing dust. This usually represents an increase in return of from 2-10 times the return over both non-processed and incorrectly burned sweeps (in other words, if you don't know what's in your sweeps, you're losing your shirt every time you send them in).