

Patnor101`s guide to:
**How to process black surface
mount chips and flatpacks.**

(Step by step directions how I did that)

From this:



To this:



While we all can recognize visible plating on various electronics components, pins and printed circuit boards there is often well hidden treasure waiting to be found.

I decided to run small experiment on approximate content of precious metals hidden inside surface mount chips and flatpacks. Just for clarification:

1. surface mount chips - I mean any black rectangular or square chip mounted on printed circuit board. All were cut out from boards.
2. flatpack – often called south and north bridge on motherboards or video cards, ball grid array chips made from two parts. Green – fiber one with square black top. I have used and processed in this experiment black top part only.

All chips were cut out from boards. There are few options how to process them, I was looking for fastest method. Ball mill can be used but instead of waiting for hours to have all material crushed I decided to speed up crushing process by using heat.



I have found coal fire as the best as it can produce high temperature and basically pyrolyze material so no visible smoke is produced. Chips practically disintegrate from heat without burning with flame. I used Stainless steel pot but cheaper version is to use just top cover part from dismantled floppy drive. Anything made from iron or steel will do, if your container is flat material can be pyrolyzed faster comparing to bigger pots.

Place chips to container and put it to fire. Chips will turn white when all combustile material is burned. I usualy leave them in fire and take them out when container and chips are red hot. Some may not be completely burned you will see that parts of them may be still black – that is where chips were tightly packed in container or just lay one on another and they will be put in fire again later.



Use ball mill or any grinding device you want cheapest method will be just piece of iron pipe with cap as mortar and iron rod as pestle. Do not breathe fine powder when grinding, do it outside.



Use sieve on resulted powder to catch all metallic parts from inside and bigger non burned material from chips. Do not throw away metallic parts from inside as many of them are plated with gold, silver palladium. They will be processed later. Put them in fine sieve and wash them with water over catch container to get all fine gold connecting wires which still may be sticked or attached to them.

Sieved powder looks like this: (it still contain small metallic pins from inside chips)



Metallic parts and pins from inside chip:



Note small pieces of gold in catch container from washing metallic parts.



Much more of that is in crushed and sieved powder. Gold wire is so thin, barely visible with naked eye, only when more pieces are accumulated you start notice deep yellow color in catching pan. I have used black plastic pan used for gold panning.

All bigger ceramic or plastic parts from sieve can be placed in fire again and then crushed so at the end you will have all material crushed to baby powder consistency.

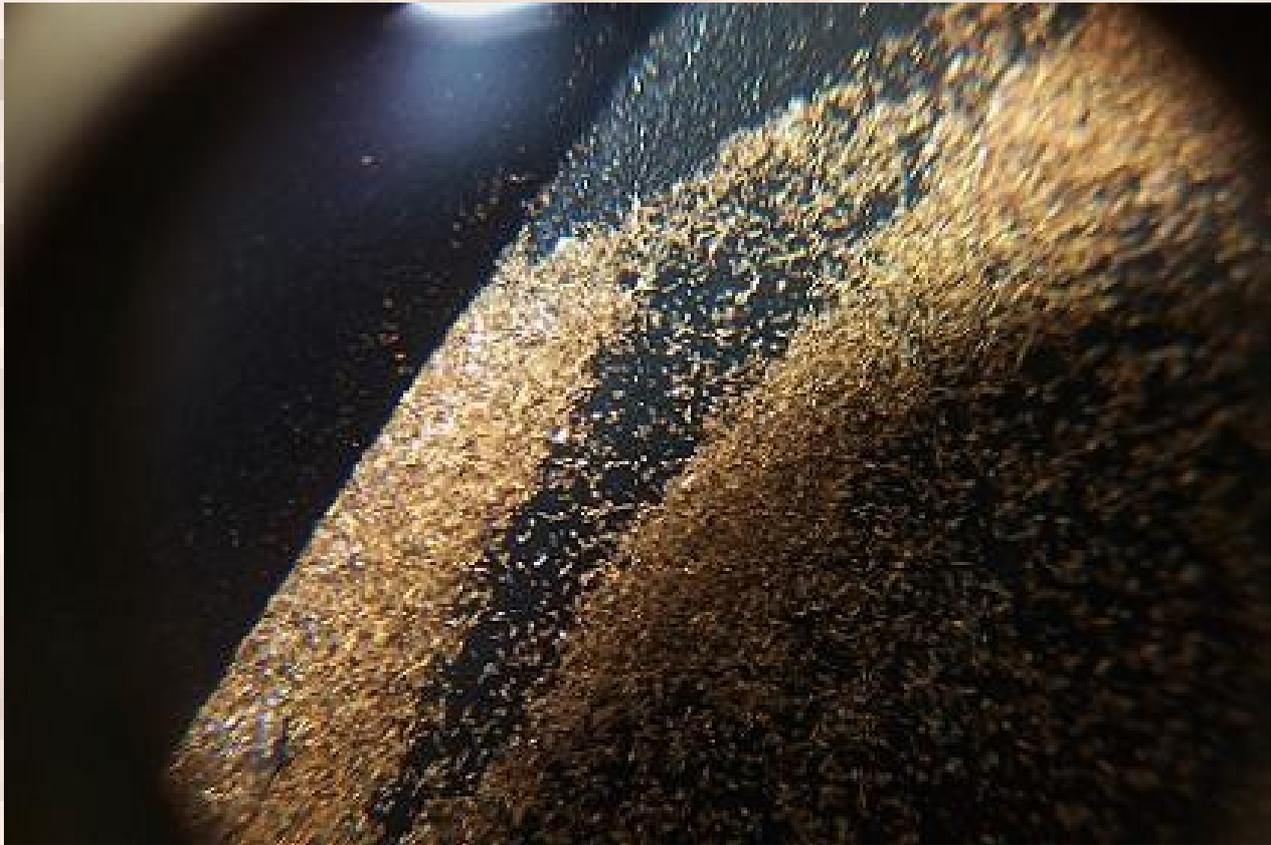


Then you can start wash all that material in water. Do it slowly. You will find that much of that powder will be floating on top so use drop or two of washing up liquid, that will clear surface and all material will sink.



If material is properly crushed most of it will turn in mud and gold due to its heavy weight will sink to bottom. Burned and powdered plastic will dissolve in water and will be carried away. You just wash material till water stop changing colour and become clear. You will notice gold starting to accumulate at bottom of pan.





This gold is still mixed with some metallic pins. You can use strong magnet from inside of hard disk drive to take out any magnetic metals. Non magnetic metals will be removed later.



Repeat burning, crushing and washing of material till you will have only concentrate where most of it will be gold wires and particles. Dont throw metallic parts away, put them in some container to process them later. Remember they still contain some amount of gold plating where gold wires were bonded and not only gold. There may be considerable quantity of Silver and some Palladium too.

You can clean resulted concentrate with different methods. There will be some copper pins and tin. I have decided to wash that first in Nitric acid. After wash in warm diluted HNO_3 (30%), I incinerated concentrate (make material red hot but do not melt in homogenous mass). After that I washed that in Hydrochloric (also called Muriatic) acid 32%.

Concentrate before cleaning:



And after washing with acids:



Resulted gold wires can be melted but to achieve high purity it is desirable to refine them to get rid of all unwanted metas. Material can be processed fastest with Aqua Regia where we dissolve everything, properly filter, reclaim gold in form of fine powder which will then be washed again several times and melted.



After all this you will be left with something like I got :)



Some more data and pictures.

I started this experiment with 7 kilograms of various chips and flatpacks. Chips were from motherboards and all peripheral cards from computers like Video, Network, Sound, Ram sticks.....

Flatpacks (BGA) chips – top parts which may contain more gold than any other chips were about 10% of all 7 kilograms. (cca 700g)

Ram stick chips were about 20% of 7 kilograms. (cca 1.5kilogram)

At the end of process I recovered 10.2g of gold.

I still have all metallic parts from inside and there is some gold on them.



We can expect higher yield, however it is very hard to present any number as there are zillions of chip types out there. One thing is a fact:

There is gold in them chips, and it's well worth to go for it :)

Picture of testing for silver in HNO₃ used for washing concentrate:



Picture of DMG test on washing solution, but I suspect any Pd will be still on metallic parts from inside:



Last picture is of button surrounded with small pieces of 14k jewellery, note colour, 14k gold looks pale compared to gold recovered from chips.



If you want to find more about recovery, recycling, refining and testing of precious metals visit www.goldrefiningforum.com and feel free to contact me there if you have question about this experiment. Feel free to participate on forum, you will find informations which are very valuable and available for any member. You may consider small donation for forum running costs as membership is free.

Thank you. Patnor101