

Aqua regia refining process

1. The metal to be refined should be assayed in order to establish contents of precious metals



Fig. 1- Assay laboratory

2. The next step is to melt the metal into a form that exposes the largest amount of surface area possible in order to reduce the dissolution times when attacked with acids. In our case, we produce metal in a "exploded popcorn form" by melting the metal in an induction melting furnace and then pouring it into a grain tank containing water. Due to the enormous thermal shock, the metal cools in this particular shape.



Fig. 2- FIM15TCPU melting furnace



Fig. 3 - RPG/G grain tank



Fig. 4 - "Exploded popcorn" grains



Fig. 5 closeup of grains

3. These grains are loaded into the refining unit.



Fig. 6 - IAQ25BR refining plant and fume scrubber

4. Nitric and hydrochloric acids are then added (in a special ratio) to the tumbler thus forming the aqua regia solution.
5. The aqua regia solution dissolves the gold; the silver is transformed by the hydrochloric acid into AgCl (silver chloride)
6. When the dissolution process is finished, the solution inside the tumbler is discharged into the filter trolley where special filter paper has previously been placed.

7. The filter papers retains the silver chloride (because it is a solid) while the solution containing the gold trickles through.
8. The solution is then trasferred to the cementation tank where various chemicals products are added in order to precipitate the gold back into a solid.
9. The entire lot (gold powder & solution) is then filtered again in the filter trolley and the gold powder is recovered.



Fig. 7 Gold powder after refining

10. This powder is then washed, rinsed and melted into the final required form (i.e. ingots etc.).
11. The silver chloride is then transformed back into metallic silver.