

1. Generate a solubility curve for Sb vs temperature in arsenic solution
2. Generate a solubility curve for Sb vs temperature in water
3. Determine the ultimate solubility of arsenic in feed
4. Cyanide leach residue to verify recoverability of gold
5. Tartaric acid / activated carbon removal of Sb at 50°C and 90°C (may need to elevate temperature to keep As in solution)
6. Chloride precipitation of Sb at 90°C (may require long time)

Ammonia Leach

Priorities in this work will be determining the relative extraction of arsenic, antimony, and iron, determining when each precipitates, and evaluating methods of removing antimony. The following tests are planned to evaluate these questions in the context of the overall process:

1. Leach flue dust at 30°C to generate a 10% As_2O_3 solution with $\text{NH}_4/\text{As} = 2$
2. Leach flue dust with the above solution to form a 20% As_2O_3 solution at $\text{NH}_4/\text{As} = 1$
3. Add NH_3 to the above 20% As_2O_3 solution to precipitate NH_4AsO_2
4. Heat and consecutively drive off H_2O of hydration and NH_3 and weigh (H_2O or NH_3 off first?)
5. Tartaric acid / activated carbon removal of Sb from NH_3 solution at 30°C (may need to elevate temperature to keep As in solution)
6. Chloride precipitation of Sb from NH_3 solution at 30°C (may require long time)

Other things which could be chased:

- A) Drive off NH_3 from 20% As_2O_3 solution by heating and/or sparging with air
- B) Kinetics of leaching
- C) Solubility curve
- D) Kinetics of precipitation
- E) Effect of precipitation rate on product physical properties
- F) Impurities (Sb) precipitation early, late, or with As?

Equipment Required

This is a list of equipment I have put together by just mentally walking through the testwork. Please let me know about any additions or questions. We will see what is available at Giant and then order what we absolutely need. I started to organize this, but ran out of gas, sorry.

Ammonia leach reactor (closed top with mixer & addition ports)
Heated reactor
Hot water bath
Shaker
Jacketted Buchner

Masterflex pump and tubing

Overhead mixer & props

NH3 flowmeter (may need to be calibrated) **SIZE?**

NH3 cylinder

NH3 valve

NH3 tank support

✓ Buchner funnel

✓ Vacuum pump or vacuum

✓ Drying oven

✓ Furnace

✓ Balance

Sparge tubes

Tygon tubing

✓ Rubber gloves

Rubber policeman

Sample bottles

Sample envelopes

Dust masks

Lab coats

✓ Marking pen

✓ Vacuum flasks

Ringstand supports

Clamps

✓ Drying pans

Sparge flask

Steam source

✓ Cleaning equipment (sponges, brushes, paper towels, etc.)

✓ Alconox or other soap

✓ Wash bottles

✓ Graduated cylinders (1, 100, & 1000 ml)

✓ Volumetric flasks (100 & 1000 ml)

✓ Pipettes (1, 5, 10, and graduated 1 ml)

✓ Pipette bulbs

✓ Filter paper (loose, medium, & tight)

✓ Maybe 0.45 micron filter

Watch glasses (for Buchner)

✓ Beakers (mix)