

55: Bromine leaching – 1990s research in Indiana

The Dadgar method of bromine leaching was invented by Ahmad Dadgar and co-workers of Great Lakes Chemical Corporation in Indiana and patented in 1997 (US #5,620,585). It may yet help to revive interest in bromide leaching, using perbromides with desirable characteristics such as high bromine levels, low bromine vapour pressure and stability even in freezing conditions.

Operation

The Dadgar method in outline is as follows.

The ore is reduced to a fine powder and leached without any preliminary roasting step.

1st stage – leaching gold into solution

Bromine is sourced from specialised suppliers as sodium bromide, as elemental bromine is particularly hazardous and extremely difficult to store or transport safely. Sodium bromide is more stable and cheaper.

The powdered ore is delivered as a continuous feed to the first of two cascade agitated leach tanks where it is mixed with an aqueous bromide solution. The resulting slurry overflows from the first leach tank to the second leach tank and overflows again to a thickener. Solids produce a sludge that passes through a countercurrent washing system of several thickeners, the final thickener being fed with an aqueous washing medium. Solids collect in the bottom of the final thickener as tailings, while the liquid fraction is a pregnant gold solution.

2nd stage – recovering gold from solution

The pregnant gold solution can be passed through ion exchange columns, as is usual, to recover the gold.

An innovative alternative invented by Ahmad Dadgar and Charles C. Shin of Great Lakes Chemical Corporation in Indiana and patented in 1990 (US #4,936,910). This recovers gold by passing the pregnant gold solution through acid-washed Sphagnum peat moss in a suitable contacting apparatus.

The sphagnum peat moss (live and dead) is chopped and screened to retain the 75 μ to 1.5mm fraction. This enables water to pass through. The screened moss is washed with a protic acid such as 0.5-1.0M HCl (10 grams of dried sieved moss per 100mL HCl) and then rinsed with deionised water until the filtrate reaches pH4.

The acid-treated sphagnum moss is packed in a column and the pregnant gold solution passed through in the manner of a typical ion-exchange column.

Experiments prove acid-treated sphagnum peat moss is able to recover about 32 milligrams of gold per gram of moss dry-weight when it is then at maximum capacity. The process is very rapid (10-20 minutes) and is indifferent to temperature variation in the range of 20 to 50°C. At least 99.9% of the gold contained in the leachate can be recovered by the sphagnum moss.

3rd stage – final recovery of gold for sale

The sphagnum moss is incinerated in a muffle furnace at 750°C to recover the metallic gold.

Adoption by placer gold miners

The Dadgar method has potential for recovering fine placer gold from concentrates but awaits field tests and promotion to placer companies, recreational miners and artisanal miners.

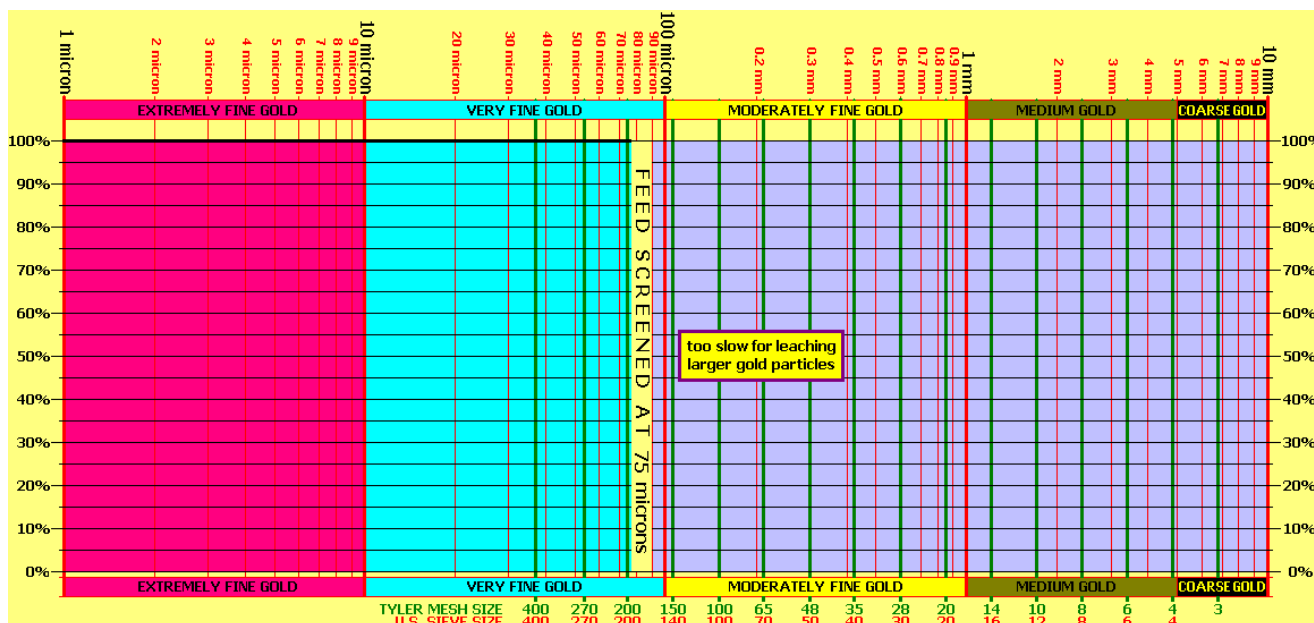


Figure 118. GOLD RECOVERY BY DADGAR METHOD OF BROMINE LEACHING
 Bromine can dissolve (leach) >90% of gold smaller than about 75 μ , but is too slow for leaching larger gold. (compiler: Robin Grayson)