

# Platinum in Arizona

Circular No. 3, August, 1980

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Platinum (in reality the entire platinum group of elements) has been and continues to be the subject of much discussion among miners in Arizona. Do the metals exist in Arizona? Are they in mineable quantities, if they do exist? Are they now produced? What is the significance of the reports of theft of platinum from Inspiration Copper Company?

The platinum group of metals comprises platinum, palladium, rhodium, iridium, osmium, and ruthenium, of which platinum is the most important. Of these metals, osmium is generally alloyed with iridium. The platinum group metals occur chiefly as natural alloys of various proportions and to a much lesser extent as sulfides and arsenides. All of these metals are rare and expensive. They possess individual properties that make them uniquely attractive for certain uses in highly developed technology and for use in jewelry and for decorative purposes.

Platinum and palladium are the most abundant and most widely used of the group; the other four metals are mainly used as alloy modifiers with platinum or palladium. The high melting points, corrosion resistance, and catalytic properties of these metals have many industrial applications.

There has been minor past production of the platinum group metals from California and Alaska, but present domestic production, mostly as a by-product in the refining of copper, is insignificant when compared with domestic consumption.

## Do the platinum group metals exist in rocks in Arizona?

The answer to this question is a qualified, "Yes." Tiny or trace amounts of the platinum group elements are distributed throughout the earth's crust. The average is reported to be about 0.00016 troy ounces per ton for platinum and about twice that for palladium. The others are about five times as rare as platinum. The platinum group elements are found mostly in geologic association with mafic and ultramafic rocks, such as peridotite, norite, and dunite. They may also be found in placer deposits derived from such rocks, if the rocks carried the minerals.

Ultramafic rocks are very uncommon in Arizona. Thus, it is probable that the average platinum group element content of rocks in Arizona would be less than the crustal average for the world. However, the geologic history of Arizona encompasses a few billion years and the possibility of the past occurrence of such rocks containing platinum elements, does exist. If such rocks have been destroyed through weathering or alteration, it is conceivable that contained platinum mineral grains might find their way into a lens of schist or placer gravels. This could result in the rare detection of platinum in an assay sample and the fact that subsequent samples from the same location would not necessarily show platinum group elements.

## **Do the platinum minerals occur in mineable quantities, if they do exist?**

The answer to this question is a qualified, "No." To our knowledge there has never been production of platinum from Arizona. The definition of ore is rock that can be mined and will yield its valuable mineral at a profit. To be classified as platinum ore, the platinum content would have to make up a significant portion of the value of the ore. The recovery of trace amounts of platinum group metals from other ores in the final stages of refining does not make the rock platinum ore. Although no one can predict the future, the present knowledge of the geology, mineralogy and economics of platinum and Arizona are not conducive to the discovery of producible quantities of platinum group metal ores in Arizona.

## **Are platinum group metals now produced from newly mined rock (not platinum ore) in Arizona?**

The answer is, "Yes." Platinum group elements are recovered from anode slimes produced during the refining of copper. Emphasis must be placed on the term "refining" of copper. Slimes are not produced at the smelter stage of copper production. In addition, the process must be electrolytic and not fire refining.

As an example, one ton of anode slimes is recovered from 178,200 tons of ore at the electrolytic refinery of Inspiration Consolidated Copper Company at Inspiration, Arizona. At this rate, the following figures can be calculated based on known concentration ratios and recoveries (custom ore to the refinery is also included in this calculation):

66 tons of copper ore = 1 ton of copper concentrate  
3 tons of concentrate(198 tons of ore) = 1 ton of copper anode  
900 tons of anode (178,200 tons of ore)= 1 ton of cathode slime  
2 tons of slime(356,400 tons of ore) = 1 ounce of platinum

In addition to the platinum, some palladium and other precious metals are recovered. By extrapolation, the copper ore assays as follows:

Platinum = 0.0000029 tr. oz/ton of ore  
Palladium = 0.000029 tr. oz/ton of ore  
Gold = 0.0026 tr. oz/ton of ore  
Silver = 0.025 tr. oz/ton of ore  
Copper = 0.5% or 10 lb/ton of ore

Such values of platinum, palladium and gold are determined by mathematical extrapolation because they are too low in value to assay directly by normal methods. It is safe to assume then that if this concentration of platinum, palladium, gold and silver did not happen automatically during refining (purification of copper), it would not and could not be recovered.

# **What is the significance of the theft of platinum from Inspiration Consolidated Copper Company?**

The media has been publishing (May -July, 1980) reports of copper and platinum thefts worth millions of dollars from Inspiration Consolidated Copper Company. Included specifically in the reports is the theft of 4899 ounces of platinum. In a report from Inspiration dated June 26, 1980, data was supplied on a reported theft of platinum from their laboratory. Quoting that report: "On November 18, 1974, 48.99 ounces of platinum, in the form of a platinum cathode, was stolen from the Analytical Lab." This may be where 4899 ounces reported in the newspapers came from if a decimal point was forgotten.

The same report went on to say that if all the platinum were extracted from the anode slimes produced by Inspiration, it would take 167 years to recover 5,000 troy ounces of platinum. The platinum, palladium, gold and silver are extracted from the slimes at custom refiners outside of Arizona.

## **In Summary**

1. Platinum and platinum group elements do occur in Arizona.
2. They are not known to occur in sufficient concentration to justify their mining.
3. They are recovered, but only when concentrated nearly 200,000 times in a process that is necessary to refinement of copper. (If the anode could be used without electrolytic refining, the precious metals would not be worth recovering.)
4. The report of a theft of large amount of platinum from Inspiration Consolidated Copper Company appears to be a typographical error.

Platinum group metals will continue to be the subject of discussion and arguments among Arizona miners. The platinum group metals have very high prices and it is the dream of most prospectors to find ores of very valuable minerals. That dream encourages prospectors to keep looking and that is how valuable mineral deposits are found. However, an erroneous report of high concentrations of platinum group metals (or any other metals, if in error) in ores will cause a prospector to spend nonproductive time and money trying to prove a mine or develop exotic extraction methods. When that happens, everyone loses, especially the prospector. The prospector should always double or triple check assay reports showing ore grade concentration of platinum group metals.

Erroneous reports of the presence of platinum group metals often stem from the difficulties in detecting them. Assays for platinum and palladium, even for amounts that could constitute ore, are much more difficult to determine than for gold. Even reliable and experienced assayers have been deceived into reporting nonexistent platinum. On the other hand, it is not likely to be missed if present and looked for.

A number of metals and minerals have been mistaken for platinum group metals due to some of their properties. Among them are "chilled" birdshot (lead alloyed with arsenic), lead fragments from other sources, specular hematite in small flakes, and old amalgam. Any of these materials

may be found in some panned concentrates. If the sample has been roasted in the presence of carbon, metallic iron or other metals may have been formed and might be reported as platinum. All of these materials may be surprisingly resistant to acid tests. Even some gold-silver alloys are nearly insoluble in aqua regia.