



Department of Mines and Mineral Resources

1502 West Washington

Phoenix, Arizona 85007

(602) 255-3791 Toll Free in Arizona - 1-800-446-4259

ASSAYERS AND ASSAY OFFICES IN ARIZONA

Circular No. 46, April, 1993

by Nyal J. Niemuth, Mining Engineer

The listed companies have informed this department that they do custom assaying for the general public. All assays are performed by or under the supervision of an assayer registered by the State of Arizona Board of Technical Registration, as required by law. For information on the registration status of specific assayers contact the Arizona Board of Technical Registration, 1951 W. Camelback Road, Phoenix, Arizona 85015, phone (602) 255-4053.

There are many additional registered assayers in Arizona, many of whom are employed by the major mining companies, who do not do assay work for the general public.

For additional information on mining, prospecting and mineral resources in Arizona, contact the Arizona Department of Mines and Mineral Resources, 1502 W. Washington, Phoenix, Arizona 85007 (602) 255-3791.

FIRE ASSAYING

The Arizona Department of Mines and Mineral Resources is often asked by prospectors how to determine the precious metal content of their samples. We recommend analysis by the fire assay method. The following is a brief summary of this method.

Fire assaying is a 3-step process:

- 1. Fusion** - The sample is mixed with flux, then heated to 1850 ° F. A slag containing the unwanted elements and a lead button containing the gold and silver are formed.
- 2. Cupeling** - The lead button is heated and oxidized in a bone ash cupel that adsorbs the lead oxide, leaving a precious metal bead in the cupel.
- 3. Parting and Weighing** - In this part of the process, the gold is separated from the silver. Two weighing steps are involved.

Discussion

Fire assaying is a series of chemical steps that takes advantage of the precious metal's chemical behavior. Those who claim they have non-fire assayable gold are saying they have a substance that chemically does not behave like gold. Arguments used to explain why fire assay is not applicable to their "Colloidal" or "Micron" gold generally fall into one of the three categories discussed below.

"The particles are so small they vaporize and so are not in the button."

1850° is below the melting point of gold. Even if the temperature goes above 1850° the vapor pressure of gold is small, so very little is lost. H₂O, for example, has vapor pressure 6 orders of magnitude higher.

"Small particles of gold float on the surface of water so they float on the slag."

This ignores the process that goes on. It is not dependent on gravity. The PbO₂, now Pb, dissolves the gold. It is the Pb that collects at the bottom of the crucible.

"Interfering elements mask the gold."

The London Mint ran an assay of 1000 mg tellurium, 1 g Au, 25 g Pb and skipped the fusion step! Even so the "worst" they could do was to lose about half the gold. These conditions are highly unlikely in a rock sample. What about the platinum group metals? These, if present, report with the gold in the bead.

Conclusion

Fire assaying, in use for thousands of years, still stands the test of time.

ARIZONA ASSAY OFFICES

AA = Atomic Absorption Analysis

ICP = Inductively Coupled Plasma Emission Spectrometry

DOUGLAS

Rochin Assay Office Inc.

Rt. 1, Box 214-H

Douglas, Arizona 85607

Carlos Rochin, Registered Assayer

Telephone: 602-364-8092

Specialty: Fire Assay

HUMBOLDT

Iron King Laboratory

Iron King Road

P O Box 66

Humboldt, Arizona 86329

Walt Statler, Registered Assayer

Telephone: 602-632-7410 or 1-800-325-4856

Specialty: Fire assay, geochemical analysis, wet chemistry

PHOENIX

Arizona Testing Laboratories

810 E. Hammond Lane

Phoenix, Arizona 85034

Claude E. McLean Jr., Registered Assayer

Telephone: 602-254-6181

Specialty: AA, cyanide solution testing

OCM Inc.

9236 N. 10th Avenue

Phoenix, Arizona 85021

John Sickafoose, Registered Assayer

Telephone: 602-943-3573

Specialty: Fire Assay, AA, wet chemistry, hydrometallurgical process development

MESA

CRM Industries

462 S. Gilbert Road, #788

Mesa, Arizona 85204

Telephone: 602-833-3821

Craig McGhan, Registered Assayer

Specialty: Fire assay, AA, wet chemistry, amalgamation, placer gold

TOMBSTONE

Armco Milling and Smelting

Charleston Road (3.5 miles west of Tombstone)

2160 E. Fry Blvd., Box 508

Sierra Vista, Arizona 85635

Telephone: 602-457-2221

Gary Lindroos, Registered Assayer

Specialty: Fire Assay, AA

TUCSON

American Assay Laboratories Inc.

3431 E. Hemisphere Loop

Tucson, Arizona 85706

George Burke, Registered Assayer

Telephone: 602-294-8078

Specialty: Fire assay

Chemex Labs Inc.

2015 North Forbes Blvd. #101

Tucson, Arizona 85745

Lloyd Twaites, Registered Assayer

Telephone: 602-798-3818

Specialty: Minerals, coal, and environmental materials

Copper State Analytical Labs Inc.

710 East Evans Boulevard

Tucson, Arizona 85713

D. A. Shaw, Registered Assayer

Telephone: 602-884-5811

Mailing Address: P O Box 7517

Tucson, Arizona 85725

Specialty: Mineral & water analysis

Jacobs Assay Office

1435 South 10th Avenue

Tucson, Arizona 85713

Ben Jacobs and Mike Jacobs, Registered Assayers

Telephone: 602-622-0813

Specialty: Fire assay, wet chemical assays, AA, preliminary metallurgical tests

Mountain States Research & Development Inc.

P O Box 310

Vail, Arizona 85641

Marvin Schloatman, Registered Assayer

Telephone: 602-624-7990

Specialty: Fire assay, AA, ICP

Skyline Labs Inc.

1775 W. Saguaro Dr.

P O Box 50106

Tucson, Arizona 85703

Charles Thompson, Registered Assayer

Wm. Lehmbeck, Registered Assayer

James A. Martin, Registered Assayer

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