K-Ar age of mineralization. Silver Peak (Red Mountain) mining district, Esmeralda County, Nevada

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K-AR AGE OF MINERALIZATION, SILVER PEAK (RED MOUNTAIN) MINING DISTRICT, ESMERALDA COUNTY, NEVADA

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This report is another in a series of studies being carried out jointly by the U. S. Geological Survey and the Nevada Bureau of Mines and Geology on ages of mineralization of epithermal precious-metal deposits in Nevada. Analytical procedures are the same as those reported in Silberman and McKee (1971). The uncertainty in reported age (±4%) represents analytical error only, at one standard deviation. Mineral separates were prepared by R. D. Dockter.

The constants used in age calculation are: $\lambda_\epsilon = 0.585 \times 10^{-10}$ yr^{-1}, $\lambda_\beta = 0.585 \times 10^{-10}$ yr^{-1}, K^{40}/K_{total} = 1.19×10^{-4} mole/mole.

GEOLOGIC DISCUSSION

The Red Mountain mining district is in a part of the Silver Peak volcanic center in the central Silver Peak Range, Esmeralda County, Nevada. The exposed rocks in the district consist of a series of interlayered volcanic and sedimentary rocks that are entirely Miocene in age.

The ore deposits yielded in excess of $3 million (Albers and Stewart, 1972) primarily in silver and gold from high-angle epithermal fissure veins that generally carried minor amounts of lead, zinc, copper, and, in some places, mercury (U. S. Bur. Mines, unpub. data). Fine-grained argentite (acanthite) is the principal ore mineral (Albers and Stewart, 1972). Veins in the district are massive banded quartz and calcite. Barite, siderite, and locally manganosiderite are the principal gangue minerals. The mineralizing fluids are generally thought to be genetically related to volcanism of the Silver Peak volcanic center (Albers and Kleinhampl, 1970; Albers and Stewart, 1972; W. J. Keith, unpub. data) and were slightly younger than the youngest volcanic unit, a trachyandesite that is cut by some of the fissure veins and has a K-Ar age of 5.9 ± 0.2 m.y. (Robinson and others, 1968).

Adularia from a sample of altered wallrock adjacent to the Sixteen-To-One vein has a K-Ar age of 5.0 ± 0.2 m.y., thus supporting the proposed genetic relations between the Silver Peak volcanism and the mineralization of the Red Mountain district suggested by earlier workers. The slightly younger age of the adularia relative to the volcanic host rocks agrees with the time relations of volcanism and mineralization in other epithermal ore deposits in the Great Basin; *e.g.*, Bodie (Silberman and others, 1972) and Goldfield (Ashley and Silberman, in press).

SAMPLE DESCRIPTION

1. 70-71A K-Ar 5.0 ± 0.2 m.y.

Adularia (Sixteen-To-One Mine; sec. 32, T. 2 S., R. 38 E.; Esmeralda Co., NV). Brecciated wallrock, adjacent to quartz-calcite Sixteen-To-One vein. Sample consists of mottled green and white volcanic breccia, which has itself been brecciated and recemented by a fine-grained intergrowth of quartz and adularia. Rock fragments have been variably altered to quartz and/or adularia. Analytical data: K_2O = 12.90%, $^*Ar^{40}$ = 0.950×10^{-10} mole/gm; $^*Ar^{40}/\Sigma Ar^{40}$ = 38%; collected by: W. J. Keith, U. S. Geological Survey; dated by: M. L. Silberman, U. S. Geological Survey. Comment: Adularia, a common mineral in vein gangue and altered wallrock in epithermal vein precious-metal deposits, shows considerable variation in structural state (Silberman and others, 1973). A detailed optical and x-ray analysis was made of the Silver Peak feldspar. Optically, the feldspar contains numerous fluid inclusions, is biaxial negative, $\alpha = 1.517(2)$, $\beta = 1.522(2)$, $\gamma = 1.523(2)$; $2V = 44(2)^\circ$ (Na); $r > v$, very weak; orientation $X \wedge a = -5^\circ$, $Y \wedge c = -21^\circ$, $Z = b$ (O.A.P. is perpendicular to (010)). Single-crystal x-ray study shows that the feldspar has the sanidine structure (space group $C2/m$).

Diffraction spots are single and relatively sharp. Least-squares refinement of the x-ray powder diffraction data (Appleman and Evans, 1973) gave the following unit-cell parameters: a = 8.590(2)Å, b = 13.002(3), c = 7.198(2), $\beta = 116° 0(1)'$, cell volume 722.4(2)Å. The Or content, determined by several methods (Orville, 1967; Wright and Stewart, 1968) ranges from 98 to 100 mol percent. The apparent low K_2O content of the feldspar (less than the stoichiometric value of 16.92%) is due to fine-grained intergrowth with quartz.

The feldspar data plot at the high Or end of the P50-56 orthoclase series of Wright and Stewart (1968), but the feldspar may be classified as a low sanidine following the proposed nomenclature of Smith (1974), on the basis of measurements of b*, c*, optic axial angle, and Or content.

Feldspars of sanidine and orthoclase structure appear to give reliable K-Ar ages, at least for rocks of Tertiary and Mesozoic age (Evernden and James, 1964; Evernden and Kistler, 1970).

REFERENCES

Albers, J. P., and Kleinhampl, F. J. (1970) Spatial relation of mineral deposits to Tertiary volcanic centers in Nevada (Chap. C), *in* U. S. Geological Survey research 1970: U. S. Geol. Survey Prof. Paper 700-C, p. C1-C10.

Albers, J. P., and Stewart, J. H. (1972) Geology and mineral deposits of Esmeralda County, Nevada: Nevada Bur. Mines and Geology Bull. 78.

Appleman, D. E., and Evans, H. T., Jr. (1973) Job 9214: Indexing least-squares refinement of powder diffraction data: U. S. Dept. Commerce, Tech. Inf. Service PB216188.

Ashley, R. P., and Silberman, M. L. (in press) Direct dating of mineralization at Goldfield, Nevada, by K-Ar and fission-track methods: Econ. Geology.

Evernden, J. F., and James, G. T. (1964) Potassium-argon dates and the Tertiary floras of North America: Am. Jour. Sci., v. 262, no. 8, p. 945-974.

Evernden, J. F., and Kistler, R. W. (1970) Chronology of emplacement of Mesozoic batholithic complexes in California and western Nevada: U. S. Geol. Survey Prof. Paper 623.

Orville, P. M. (1967) Unit-cell parameters of the microcline-low albite and the sanidine-high albite solid solution series: Am. Mineralogist, v. 52, nos. 1-2, p. 55-86.

Robinson, P. T., McKee, E. H., and Moiola, R. J. (1968) Cenozoic volcanism and sedimentation, Silber Peak region, western Nevada and adjacent California: Geol. Soc. America Mem. 116, p. 577-611.

Silberman, M. L., Chesterman, C. W., Kleinhampl, F. J., and Gray, C. H., Jr. (1972) K-Ar ages of volcanic rocks and gold-bearing quartz-adularia veins in the Bodie mining district, Mono County, California: Econ Geology, v. 67, no. 5, p. 597-604.

Silberman, M. L., Johnson, M. G., Koski, R. A., and Roberts, R. J. (1973) K-Ar ages of mineral deposits at Wonder, Seven Troughs, Imlay, Ten Mile, and Adelaide mining districts in central Nevada: Isochron/West, no. 8, p. 31-35.

Silberman, M. L., and McKee, E. H. (1971) K-Ar ages of granitic plutons in north-central Nevada: Isochron/West, no. 1, p. 15-32.

Smith, J. V. (1974) Feldspar minerals, Vol. 1, Crystal structure and physical properties: New York, Springer-Verlag.

Wright, T. L., and Stewart, D. B. (1968) X-ray and optical study of alkali feldspar – (Pt.) 1, Determination of composition and structural state from refined unit-cell parameters and 2V: Am. Mineralogist, v. 53, nos. 1-2, p. 38-87.