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K-Ar AGES OF MICAS RELATED TO MINERALIZATION IN SELECTED MINING DISTRICTS, LYON AND MINERAL COUNTIES, NEVADA

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Secondary biotite, sericite, and other white mica from four mining districts in Lyon and Mineral Counties, western Nevada, were dated by the K-Ar technique. The samples (fig. 1) were collected in 1981 by F. J. Kleinhampl, W. D. Menzie II, W. J. Moore, and L. K. Meitzner during a mineral resource appraisal of the Walker Lake 1° by 2° quadrangle, California and Nevada. The districts from which the samples were collected are in different mountain ranges, widely separated, and they differ in some major aspects of their geologic settings. All of the samples, however, come from the Mesozoic granitic terrain and represent either altered granitic rock or its contact aureole. The mining districts and mines are, from east to west: the Santa Fe (New York Mine), Gabbs Valley Range; the Silver Star (Sunday claims), Excelsior Mountains; the Hawthorne (Seramin property), Wassuk Range; and the Wilson (Wheeler Mine), Pine Grove Hills.

Pure mineral separates were prepared by the U.S. Geological Survey, Menlo Park, California, using techniques described by Silberman and McKee (1971). Potassium was analyzed by flame photometry using a lithium metaborate fusion technique, with the lithium serving as an internal standard (Ingamells, 1970). Argon analysis was done by standard isotope dilution mass spectrometry techniques using procedures described by Dalrymple and Lanphere (1969). The constants used in age calculation are those recommended by Steiger and Jager (1977), and they are: $\lambda_\epsilon + \lambda_\epsilon' = 0.581 \times 10^{-10}yr^{-1}$; $\lambda_\beta = 4.962 \times 10^{-10}yr^{-1}$; and $^{40K/K}total = 1.167 \times 10^{-4}$. Precision (±) is at σ.

GEOLOGIC DISCUSSION

Secondary biotite and other white mica from the four mining districts discussed here occured in either Cretaceous or possibly Jurassic plutonic rocks or, in one case, formed in contact metasomatized rock adjacent to a Mesozoic pluton. This relationship to Mesozoic plutons is a feature common to all four samples, even though the sample localities are separated by tens of miles, include nonplutonic country rock of differing age and lithology, and represent different types of metallization. All the mica ages, however, are nearly the same, ranging from about 80 to 87 m.y. old. This similarity, imprinted across such a broad and diverse region of western Nevada, supports speculation that regional intrusion of batholithic proportions took place about 80–90 m.y. ago. This regional event, represented by a few 80-m.y.-old granitic bodies now exposed and seen in the mica ages reported here, was the last major plutonic phase of western Nevada. It corresponds closely with the last intrusive epoch of the Sierra Nevada batholith—the Cathedral Range intrusive epoch of Evernden and Kistler (1970).

Santa Fe district (New York Mine area), Gabbs Valley Range

The district is known best for its past copper production, and a small amount of copper was produced at the New York Mine. Nearby mines yielded silver as well as copper. The ore generally occurs in contact-metasomatized zones in limestone of the Triassic Luning Formation adjacent to granitic rocks. The plutonic rock near the New York Mine is a quartz monzonite porphyry of the informally named Giroux Mountain suite of plutonic rocks. It is assumed to be Cretaceous and is probably approximately 87 m.y. old, based on the age of the green sericite sample from the contact metasomatic aureole of the plutonic rock.

Silver Star district (Sunday claim), Excelsior Mountains

A group of uranium(?) prospects in sericitized granitic rock and Tertiary andesite breccia constitutes the Sunday claim group in the Silver Star district. The granitic rock was mapped with the granite of Whisky Flat, a pluton comprised of porphyritic medium- to coarse-grained biotite granite. The age of this pluton is not known, but it is considered, from intrusive relationships, to be older than the 104-m.y.-old granodiorite of Huntoon Valley (John, 1983). The sericite age of 84.1 ± 2.5 m.y. is related to an alteration event younger than the granite of Whisky Flat and corresponds to the time of major plutonism in the Sierra Nevada and western Nevada.

Hawthorne district (Seramin property), Wassuk Range

The Seramin property, in the vicinity of Jim Canyon, includes claims along an altered and mineralized shear zone in granitic rock. Tungsten, molybdenum, and copper are present in parts of the zone. The granitic rock is mapped with the granodiorite of Alum Creek, an equigranular to porphyritic, medium- to coarse-grained biotite granodiorite that yielded K-Ar ages of approximately 77 m.y. (Evernden and Kistler, 1970; ages recalculated using the new K-Ar constants) and a Rb/Sr isochron age of 77.4 ± 3.6 m.y. (A. C. Robinson, oral commun., 1982). The K-Ar age of 79.8 ± 2.4 m.y. on white mica in a pegmatitic phase in the shear zone is contemporaneous with the age of emplacement of the pluton.

Wilson district (Wheeler Mine), Pine Grove Hills

The Wheeler Mine is in dark sheared granodiorite cut by dikes of granite porphyry. The granodiorite, informally called granodiorite of Lobdell Summit by Stewart and others (1981), is medium-grained hornblende granodiorite. Its age is uncertain, but based on intrusive relationships it is older than the nearby granodiorite of Nye Canyon dated at 89 and 92 m.y. (Krueger and Schilling, 1971; ages recalculated using the new K-Ar decay constants and abundance ratio). The age of the secondary (alteration) biotite from the sheared rock at the mine site is 81 ± 2.4 m.y.; this age is assumed to be the age of the gold-silver metallization of the area.

SAMPLE DESCRIPTIONS

1. *SF-R1* K-Ar
Contact metasomatized limestone of Triassic Luning Formation (38°30'08"N, 118°04'40"W; Gabbs Valley Range, Mineral Co., NV). *Analytical data:* K_2O

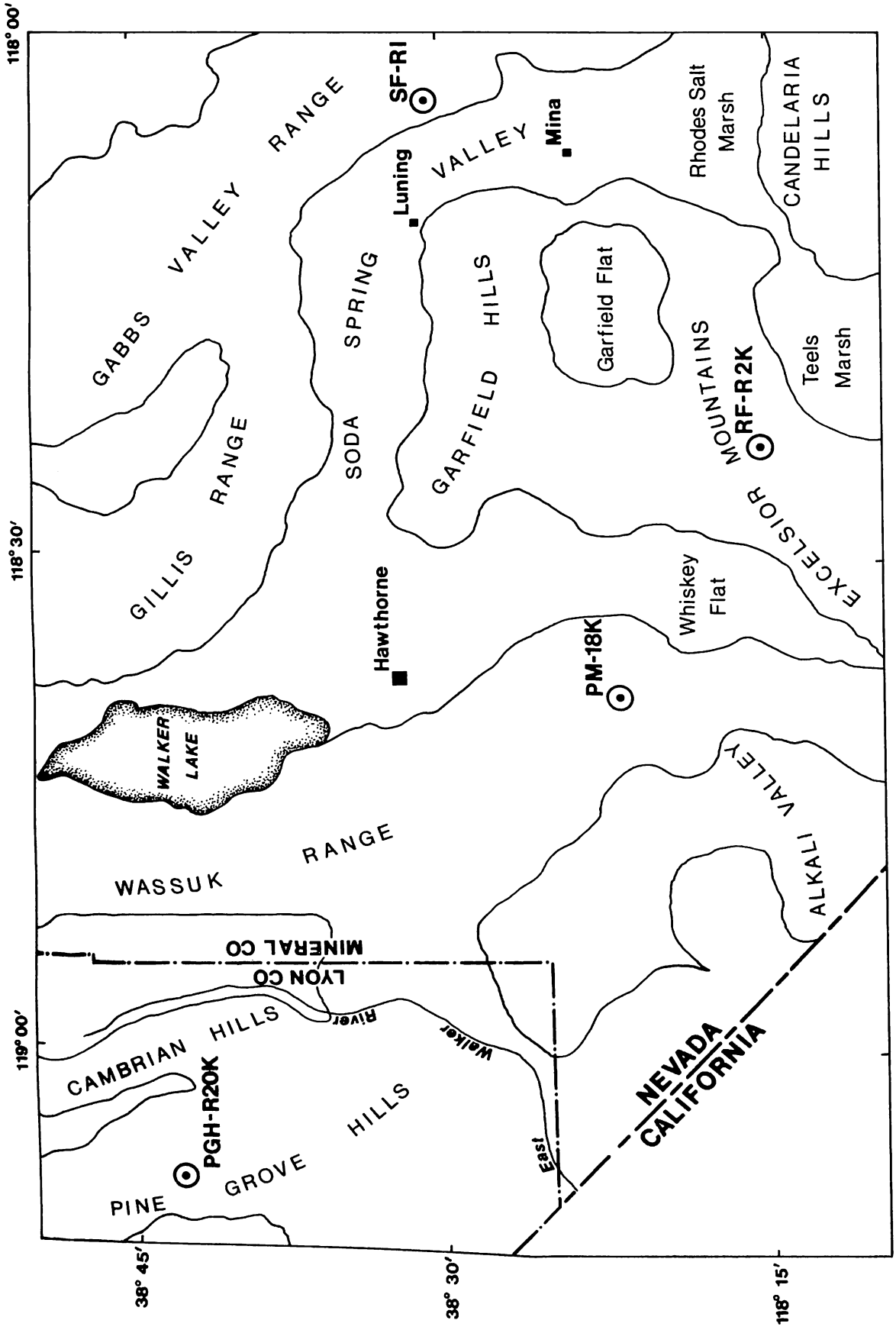

FIGURE 1. Map showing sample locations.

= 9.78%; $^{40}Ar^*$ = 1.2489 × 10^{-9} mole/g; $^{40}Ar^*/\Sigma^{40}Ar$ = 94.1%. *Comments:* This limestone is near outcrops of endoskarn and quartz monzonite porphyry of the informally named Giroux Mountain suite of plutonic rocks.

(green sericite) 86.6 ± 2.5 m.y.

2. *RF-R2K* K-Ar

Oxidized sericitized uraniferous(?) granitic rock (38°15'15"N, 118°26'07"W; Excelsior Mountains, about 6 mi W of Marietta, Mineral Co., NV). *Analytical data:* K_2O = 11.05%; $^{40}Ar^*$ = 1.3703 × 10^{-9} mole/g; $^{40}Ar^*/\Sigma^{40}Ar$ = 91.1%. *Comments:* The granitic rock contains blobs and lenses of vuggy quartz and is porphyritic biotite granite that was mapped with a pluton older than 104 m.y. Sericite is commonly associated with lensoid hematized patches within the granitic rock. These altered zones may represent the upper level of a weakly developed stockwork and reflect an as yet concealed pluton.

(sericite) 84.1 ± 2.5 m.y.

3. *PM-18K* K-Ar

Veined pegmatitic phase of a granitic rock (38°21'40"N, 118°38'20"W; southern Wassuk Range, Mineral Co., NV). *Analytical data:* K_2O = 11.00%; $^{40}Ar^*$ = 1.2918 × 10^{-9} mole/g; $^{40}Ar^*/\Sigma^{40}Ar$ = 97.2%. *Comments:* The granitic rock is in a mineralized shear zone that is mapped with the granodiorite of Alum Creek, a porphyritic to equigranular biotite granodiorite that yielded K-Ar ages of approximately 77 m.y. (Evernden and Kistler, 1970) and a Rb/Sr age of 77.4 m.y. (A. C. Robinson, oral commun., 1982).

(white mica) 79.8 ± 2.4 m.y.

4. *PGH-R2OK* K-Ar

Sheared hornblende granodiorite of Lobdell Summit (38°40'15"N, 119°10'45"W; Pine Grove Hills, Lyon Co., NV). *Analytical data:* K_2O = 9.17%; $^{40}Ar^*$ = 1.0909 × 10^{-9} mole/g; $^{40}Ar^*/\Sigma^{40}Ar$ = 93.6%. *Comments:* This pluton is older than the nearby granodiorite of Nye Canyon, dated at approximately 90 m.y. (Krueger and Schilling, 1971).

(secondary biotite) 80.8 ± 2.4 m.y.

REFERENCES

Dalrymple, G. B., and Lanphere, M. A. (1969) Potassium-argon dating: San Francisco, W. H. Freeman Co., 258 p.

Evernden, J. F., and Kistler (1970) Chronology of emplacement of Mesozoic batholithic complexes in California and western Nevada: U.S. Geological Survey Professional Paper 623, 42 p.

Ingamells, C. O. (1970) Lithium metaborate flux in silicate analysis: Analytica Chimica Acta, v. 52, p. 323–334.

John, D. A. (1983) Map showing the distribution, ages, and petrographic characteristics of Mesozoic plutonic rocks, Walker 1° by 2° quadrangle, California and Nevada: U.S. Geological Survey Miscellaneous Field Studies Map MF–1382–B, scale 1:250,000.

Krueger, H. W., and Schilling, J. H. (1971) Geochron/Nevada Bureau of Mines K/Ar age determinations—list 1: Isochron/West, no. 71–1, p. 9–15.

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.

Steiger, R. H., and Jager, E. (1977) Subcommission on geochronology—Convention on the use of decay constants in geo- and cosmochronology: Earth and Planetary Science Letters, v. 36, p. 359–362.

Stewart, J. H., Reynolds, M. W., Johannesen, D. C., and Dohrenwend, J. C. (1981) Geologic map of the Mount Grant quadrangle, Lyon and Mineral Counties, Nevada: U.S. Geological Survey Miscellaneous Field Investigations Map MF–1278, scale 1:62,500.