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Isochron/West, Bulletin of Isotopic Geochronology, v. 18, pp. 5

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AGE OF EMPLACEMENT AND MINERALIZATION OF THE MAJUBA HILL INTRUSIVE COMPLEX, PERSHING COUNTY, NEVADA

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Majuba Hill, in Pershing County, NV, on the east side of the Antelope Range and 18 road mi west of Imlay, is underlain by a complex of mostly rhyolitic porphyries and breccias of early Miocene age intruded into a series of steeply dipping Triassic(?) argillites. The intrusive rocks are separable into five different assemblages. Northeast-trending structures in the argillites controlled the distribution and configuration of the intrusive rocks. Large intrusive masses are elongated in a northeast direction, and dikes and sills trend northeast as well. The intrusive center is fan shaped; the different magmas were intruded through a relatively restricted conduit and then spread laterally near the present surface (MacKenzie and Bookstrom, 1976).

The five assemblages of intrusive rocks include four groups of rhyolites and one of latite, which is the youngest. The earlier intrusive assemblages formed stocks; the later ones are dikes and sills. The early associated breccias form large irregular masses related to the upper surfaces of the early stocks; later breccias form dikes, sills, and pipes, the youngest being pebble dikes and pods.

All intrusive masses, including the latite, have associated alteration and Cu, Mo, or Sn mineralization. Silicic, K-silicate, phyllic (quartz-sericite), argillic, and propylitic alteration are present. Also most Majuba rocks are weakly iron oxide stained. Small amounts of copper and tin were produced from the Majuba Mine, which occurs in one of the younger of the rhyolite assemblages (MacKenzie and Bookstrom, 1976).

Because of the pervasive and overlapping nature of the alteration, no attempt was made to sample all the units.

The isotopic ages of the dated units all overlap within the analytical uncertainty, which is on the order of 3 percent, or 0.7 to 0.8 m.y. The K-Ar data suggest strongly that at least for the last three episodes of intrusion-alteration-mineralization the time span was relatively short, less than 1 m.y. Of particular interest is the overlap of the K-Ar ages of emplacement and alteration of the Q-T Porphyry, which supports the conclusion that intrusion and alteration-mineralization were closely related processes (MacKenzie and Bookstrom, 1976).

Because samples of the two older intrusive assemblages are too altered to give reliable isotopic ages, the total time it took for the intrusive complex to form could not be determined.

In summary: K-Ar age data indicate that intrusive and hydrothermal activity of Majuba Hill took place in the middle Tertiary, approximately 24-25 m.y. ago, and that at least the last three of the five stages of the activity took place over a brief period of time, probably not exceeding 1 m.y.

ANALYTICAL TECHNIQUES

Potassium was analyzed by flame photometer, using a lithium metaborate fusion technique, the lithium serving as an interval standard (Ingamells, 1970). Lois Schlocker of the U. S. Geological Survey was the analyst.

Argon was extracted from purified mineral separates in a pyrex high-vacuum system using external RF induction heating. During fusion a calibrated spike of Ar^{38} is introduced. Reactive gases were removed by an artificial molecular sieve, and copper-copper oxide and titanium furnaces. Mass analyses of the purified argon were made with a Nier-type 60°-sector 15.24 -cm-radius mass spectrometer, operated in the static mode. The technique is described in detail by Dalrymple and Lanphere (1969).

The ± figures represent analytical uncertainty only and are estimated at one standard deviation. The uncertainty is approximately 3%.

Constants used in calculation of ages: $\lambda_\beta = 4.963 \times 10^{-10}\ yr^{-1}$, $\lambda_\epsilon = 0.572 \times 10^{-10}\ yr^{-1}$, $\lambda_{\epsilon'} = 8.78 \times 10^{-13}\ yr^{-1}$, $^{40}K/K_{(total)} = 1.167 \times 10^{-4}$ (mole/mole).

SAMPLE DESCRIPTIONS

1. MH-3 — K-Ar

   Q-T Rhyolite Porphyry (from outcrop; sec. 2, T. 32 N., R. 31 E., elevation 5,750 ft; Majuba Hill, Pershing Co., NV), porphyritic rhyolite, of the late rhyolite porphyry assemblage; minor sericitic alteration of plagioclase and groundmass. Analytical data: K_2O = 12.72, 12.72%; radiogenic $Ar^{40} = 4.557 \times 10^{-10}$ m/g; atmospheric Ar^{40} = 86%.

   (K-feldspar) 24.7±0.7 m.y.

2. MH-4 — K-Ar

   Biotite latite (from drill hole no. 1, 697-715 ft below collar at an elevation of 5,450 ft; W½ SW¼ NE¼ sec. 2, T. 32 N., R. 31 E.; Majuba Hill, Pershing Co., NV) of the latite assemblage of the Majuba Hill igneous complex; fresh, with some disseminated sulfides. Analytical data: K_2O = 5.64, 5.61%; radiogenic $Ar^{40} = 1.965 \times 10^{-10}$ m/g; atmospheric Ar^{40} = 68%.

   (alkali feldspar) 24.1±0.7 m.y.

3. MH-5 — K-Ar

   K-feldspar vein (from drill hole no. 1, 2,606.5 ft below collar at an elevation of 3,915 ft; W. edge SW¼ NE¼ sec. 2, T. 32 N., R. 31 E.; Majuba Hill, Pershing Co., NV) cutting K-silicate altered Pinhead Porphyry. The alteration and feldspar veins are probably related to nearby Majuba Porphyry (W. B. MacKenzie, written communication, 1976). X-ray diffraction analysis by

3. (continued)
3 reflection method of Wright (1968) indicates the K-feldspar has an orthoclase structure. Analytical data: K_2O = 13.67, 13.56%; radiogenic Ar^{40} = 4.948 x 10^{-10} m/g; atmospheric Ar^{40} = 89%.
(K-feldspar) 25.1±0.8 m.y.

4. MH-6 K-Ar
Phyllic alteration (from drill hole no. 9, 680-696 ft below collar at an elevation of 5,350 ft; SW¼ SW¼ NE¼ sec. 2, T. 32 N., R. 31 E.; Majuba Hill, Pershing Co., NV) in Q-T Porphyry. Porphyritic rhyolite, most K-feldspar and plagioclase altered to sericite. Analytical data: (K-feldspar) K_2O = 14.29, 14.24%; radiogenic Ar^{40} = 5.325 x 10^{-10} m/g; atmospheric Ar^{40} = 79%. (Sericite) K_2O = 8.99, 9.01%; radiogenic Ar^{40} = 3.309 x 10^{-10} m/g; atmospheric Ar^{40} = 79%.
(K-feldspar) 25.7±0.8 m.y.
(sericite) 25.3±0.8 m.y.

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