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K-Ar AGES OF MINERALIZATION ASSOCIATED WITH THE SAN ANDREAS FAULT SYSTEM IN WEST-CENTRAL CALIFORNIA

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We report here K-Ar age determinations on three adularia samples collected from three separate mineralized areas in the Franciscan Complex along the northeastern side of the San Andreas fault in west central California (fig. 1).

Adularia was separated from vein rock by standard heavy liquid and magnetic methods. The separates were treated with 10% HF and 15% HNO_3, using the method of Silverman (personal comm., 1978) (10% HF for two minutes/15%HNO_3 for thirty minutes). Purity of the adularia separates was determined by x-ray diffraction and examination of grains in immersion liquids under the petrographic microscope.

Potassium was analyzed by flame photometry using a lithium metaborate fusion technique, with the lithium serving as an internal standard (Ingamels, 1970). Argon analyses were done by standard isotope dilution mass spectrometry techniques described by Dalyrmple and Lanphere (1979). The constants used in the age calculations are those recommended by Steiger and Jager (1977): $\lambda\epsilon + \lambda\epsilon' = 0.581 \times 10^{-10}\ yr^{-1}$, $\lambda\beta = 4.962 \times 10^{-10}\ yr^{-1}$, and $^{40}K/Ktotal = 1.167 \times 10^{4}$ mole/mole. Precision is given at the one σ level.

The adularias range in age from 12.2 ± 0.1 Ma to 13.5 ± 0.1 Ma. Previous work in northern California (McLaughlin and others, 1985) showed that similar mineralization occurs along the San Andreas fault at Point Delgada in Humboldt County, near the intersection of the San Andreas fault with the Mendocino fracture zone. Adularia separated from the Ag-bearing base metal veins at Point Delgada yielded a radiometric age of 13.8 ± 0.4 Ma and determined on the basis of fluid inclusion studies to have formed at an average temperature of 250°C, at depths between 400 and 1,200 meters. Therefore, the similar occurrences of vein mineralization whose ages are herein reported are also considered to be epithermal and associated with the San Andreas fault system. These occurrences appear to be the continuation of a series of northward—younging epithermal veins which are offset across the San Andreas fault system. The age trend of these veins mimics northwardly younging volcanism in the Coast Ranges related to propagation of the Mendocino triple junction (Dickinson and Snyder, 1979; Fox and others, 1985).

The mineralization consists of epithermal quartz-carbonate veins which locally are sulfide-bearing and contain a base metal sulfide assemblage of argentiferous galena, sphalerite, pyrite, and chalcopyrite. The principal vein gangue minerals are quartz and calcite, which are accompanied by minor chlorite, adularia and dolomite. Adularia is disseminated in altered sandstone adjacent to the veins and forms euhedral crystals up to 3mm in size encrusting quartz and calcite-lined fractures. The sulfides occur as fine- to medium-grained euhedral to subhedral crystals and crystal aggregates disseminated in vein quartz and calcite, and as small (less than 1 mm) euhedral crystals in quartz and adularia crystal lined vugs.

The quartz-carbonate veins which are up to 10 centimeters (4 inches) in width, are localized within the fault

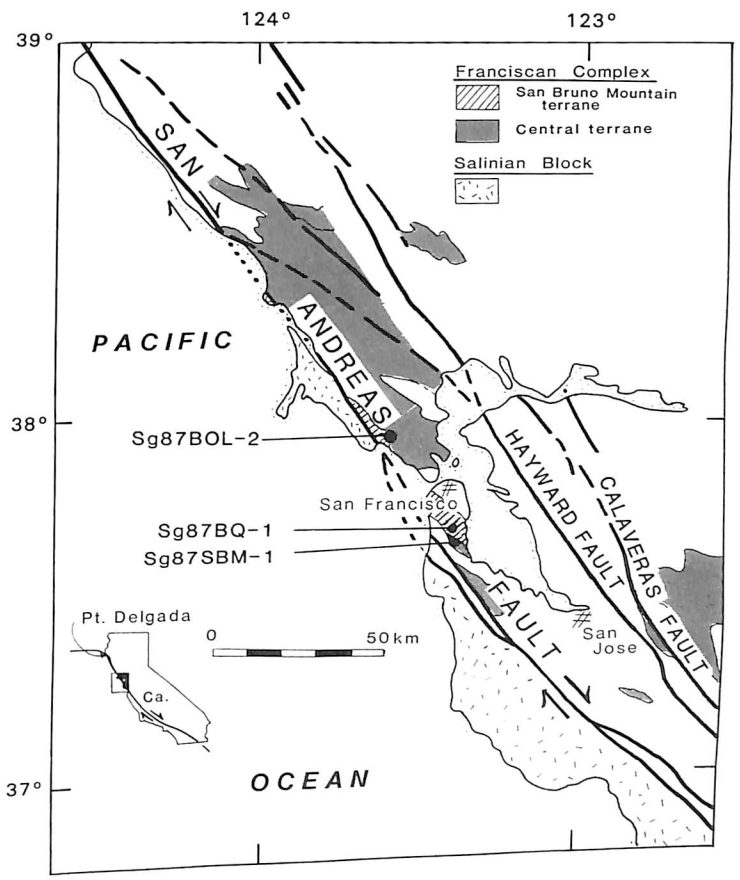

FIGURE 1. Generalized terrane map (modified from Blake and others, 1984) showing sample localities from three separate mineralized areas in the Franciscan Complex.

plane and narrow zones of hydrothermally altered sandstone which trend parallel to steeply dipping north- to northwest-trending faults that cut the Central and San Bruno Mountain terranes of the Franciscan Complex (Blake, Howell, and Jayko, 1984). All of the mineralized fault zones are located within 6.4 kilometers (four miles) of the San Andreas fault zone.

SAMPLE DESCRIPTIONS

1. *Sg87BOL-2* (Gluskoter, 1969) K-Ar
Adularia from an epithermal quartz-carbonate vein (37°55'30"N, 122°38'20"W; at the McKinnan Gulch copper prospect, on Bolinas Ridge (San Bruno Mountain terrane); Bolinas 7½' quad., Marin Co., CA). *Analytical data:* K_2O = 15.57 wt%; $^{40}Ar^*$ = 2.755 × 10^{-10} mol/gm; $^{40}Ar^*/\Sigma^{40}Ar$ = 71.3%.
(adularia) 12.2 ± 0.1 Ma

2. *Sg87SBM-1* (Huguenin, and Castello, 1920) K-Ar
Adularia from epithermal quartz-carbonate veins in hydrothermally altered sandstone (37°39'55"N, 122°25'20"W; on hill 581, South San Francisco (central terrane); San Francisco South 7½' quad., San Mateo Co., CA). *Analytical data:* K_2O = 15.68 wt%; $^{40}Ar^*$ = 3.072 × 10^{-10} mol/gm; $^{40}Ar^*/\Sigma^{40}Ar$ = 87.6%.

(adularia) 13.5 ± 0.1 Ma

3. *Sg87BQ-1* K-Ar
Adularia from epithermal quartz-carbonate veins (37°54'50"N, 122°37'32"W; collected at Brisbane Quarry (San Bruno Mountain terrane); San Francisco South 7½' quad., San Mateo Co., CA). *Analytical data:* K_2O = 14.64 wt%; $^{40}Ar^*$ = 2.866 × 10^{-10} mol/gm; $^{40}Ar^*/\Sigma^{40}Ar$ = 83.2%.

(adularia) 13.5 ± 0.1 Ma

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