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K-AR DATING OF HYDROTHERMAL ALTERATION, IXTAPAN DE LA SAL, MEXICO STATE, MEXICO

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A thick sedimentary-volcanic sequence with varying degrees of hydrothermal alteration and metamorphism is exposed over an extensive area in the States of Michoacan, Mexico, and Guerrero, between the Mexican volcanic belt and the Balsas basin. The sedimentary rocks include phyllites, sandstones, quartzites, and foliated limestones, whereas the volcanic rocks include andesites, tuffs and agglomerates. The volcanic rocks are of predominantly green color (Roca Verde Taxco Viejo, Fries, 1960) and the lavas show pillow structures typical of oceanic flows (Campa et al., 1974; Campa, 1978). This suggests that the lavas were deposited in a marine environment; e.g., at a mid-oceanic spreading center, minor spreading center in a back-arc basin, or at an island arc (Coleman, 1977).

Fries (1960) considered the volcanic activity to be Late Triassic and the alteration and metamorphism to be Early Jurassic. More recently, Campa et al. (1974) have assigned the volcanism and deposition of sediments to the Late Jurassic to Early Cretaceous and the alteration and metamorphic event to the late Early Cretaceous. Field work for paleomagnetic purposes was carried out in stratigraphic order in several localities near Ixtapan de la Sal, Mexico State (Urrutia-Fucugauchi, 1980) and revealed that the degree of alteration and metamorphism apparently decreased with increasing stratigraphic level. Petrographic analyses indicated that the lower lava samples suffered low-grade metamorphism, corresponding to greenschist facies, whereas the upper lava samples were less affected, showing hydrothermal alteration (propylitization). Samples from both groups were selected for K-Ar dating. The study was carried out in the Instituto de Geocronología y Geología Isotópica (University of Buenos Aires, Argentina). The techniques used are those described by Linares et al. (1973) and Linares and Valencio (1975). The dates obtained for the lower and upper lava samples are 108 ± 5 m.y. and 125 ± 5 m.y., respectively. The results probably date the alteration and metamorphic event, which supports the conclusions of Campa et al. (1974) and Campa (1978). The "closing" of the isotopic system of the lower samples occurred some 17 m.y. later than that of the upper lava samples, which correlates with the degree of alteration and metamorphism of these rocks. Also, comparison of the preliminary paleomagnetic data obtained with the apparent polar wander path for Mexico (Urrutia-Fucugauchi, 1979) suggests an Early Cretaceous age for the remanent magnetization (Urrutia-Fucugauchi, 1980), which correlates with the metamorphic event and resetting of the K-Ar isotopic system.

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SAMPLE DESCRIPTION

1. **AK-1422** K-Ar
Greenschist (road cut near Ixtapan de la Sal; $18^{\circ}50'N$, $99^{\circ}43.2'W$; Mexico State, Mexico). Contains fragments of altered plagioclase in a matrix of sericite, chlorite, limonite, quartz and clay minerals: also contains magnetite and apatite. *Analytical data:* $K_2O = 0.16\%$, radiogenic $Ar^{40} = 0.317 \times 10^{-10}$ mole/g, atmospheric $Ar^{40} = 46.1\%$.
(whole-rock) 108 ± 5 m.y.
2. **AK-1421** K-Ar
Altered andesite (road cut near Ixtapan de la Sal; $18^{\circ}50'N$, $99^{\circ}43.1'W$; Mexico State, Mexico). Plagioclase altered to sericite. Also contains clinopyroxene, magnetite and small amounts of chlorite, quartz, epidote, hematite and limonite. *Analytical data:* $K_2O = 1.10\%$, radiogenic $Ar^{40} = 2.476 \cdot 10^{-10}$ mol/g, atmospheric $Ar^{40} = 8.1\%$.
(whole-rock) 125 ± 5 m.y.

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