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Rb-Sr AND K-Ar ANALYSES OF EVAPORITE MINERALS FROM SOUTHEASTERN NEW MEXICO

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INTRODUCTION

Attempts to determine radiometric ages on the massive salt deposits of the Salado Formation in southeastern New Mexico are of interest for several reasons. First, the stratigraphic age of these beds is reasonably well known (Late Permian), and reliable radiometric ages would add to the calibration of the geological time scale in this time period. Secondly, the salt beds have a diverse mineralogy and provide an opportunity to test the possibility of performing reliable age determinations on several unusual minerals. Finally, the ages determined may have a significant bearing on the decision as to whether or not these salt beds have been stable for a long enough period of time to allow their use as a site for the disposal of nuclear waste products.

A suite of minerals, primarily polyhalites, from the Waste Isolation Pilot Plant (WIPP) site in southeastern New Mexico have been analyzed for their K-Ar ages (Brookins and others, 1978; 1980) and proved to be reasonably reliable for age determination. We have now had the opportunity to study a number of other selected samples of evaporite minerals from the Salado Formation using Rb-Sr and K-Ar geochronologic methods. The samples for this particular study were collected by Norbert Rempe of the International Minerals Corp. from their potash mine. A binocular microscope was used to select appropriate samples. Mineral identifications were verified by X-ray diffraction.

The Rb-Sr analyses were performed at the University of New Mexico and the K-Ar analyses at Geochron Laboratories, Cambridge, Massachusetts. Standard analytical techniques were employed. An initial $^{87}Sr/^{86}Sr$ = 0.7080 is assumed in calculating the Rb-Sr ages. All analytical K-Ar values are the averages of two or more analyses. K-Ar ages are calculated using the constants of Steiger and Jager (1977).

COMMENT

The leonite samples (IMC-2A, 2B) yield fairly low Rb-Sr and very low K-Ar ages. The K-Ar age is due, in part, to the difficulty in analyzing this material due to its hydroscopic nature. Since leonite is a common secondary evaporite mineral, it is not known if the Rb-Sr apparent ages reflect a mineral formational age of 78-110 m.y. or an anomalously low Rb-Sr age due to loss of radiogenic Sr, gain of Rb, or some other factors. The apparent Rb-Sr dates are both very much older than the K-Ar age.

The impure carbonate-silicate sample (IMC-1) is not well suited for age work, especially since it is admixed with sylvite. Yet we feel that we have removed the sylvite from the sample because the $^{87}Sr/^{86}Sr$ ratios are near 0.71, whereas most sylvites yield ratios of greater than 1.0 (Register, 1979). The Rb-Sr age of 183 m.y. is in good agreement with earlier published Rb-Sr and K-Ar ages from the evaporites (Brookins and others, 1980), although the K-Ar date is anomalously high. We suspect excess argon incorporation into this sample, especially since it is mixed with sylvite, as opposed to presence of detrital material. If detrital material were present, both the Rb-Sr and K-Ar ages should be old, not just the K-Ar age.

The langbeinite samples (IMC-3A, 3B) yield both Rb-Sr and K-Ar ages in good agreement with earlier published dates (Brookins and others, 1980), although the range in dates from 173 to 220 m.y. is lower than the oldest langbeinite reported from the area (Schilling, 1973).

The sylvite samples (IMC-5A, 5B) yield Rb-Sr and K-Ar dates in the range of 177–180 m.y., which is somewhat surprising since most sylvites reported so far yield low and scattered K-Ar ages (Brookins and others, 1980).

SAMPLE DESCRIPTIONS

1. *IMC-1* — Rb-Sr, K-Ar

Magnesite, talc, sylvite, halite (32°25'N,103°56'W; International Minerals Corp. mine, Eddy Co., NM). *Analytical data:* $^{87}Sr/^{86}Sr$ = 0.7149; Rb = 26.2 ppm; Sr = 27.0 ppm; $^{87}Rb/^{86}Sr$ = 2.81. K = 0.923%; $^{40}Ar^*$ = 0.02117 ppm; $^{40}Ar^*/\Sigma^{40}Ar$ = .358. *Comments:* Impure sample. The sylvite and halite were removed by repeated washings with deionized water.

magnesite-talc (Rb-Sr)183 m.y.
magnesite-talc (K-Ar)304 ± 12 m.y.

2. *IMC-2A, 2B* — Rb-Sr, K-Ar

Leonite, halite ± sylvite (32°25'N,103°56'W; International Minerals Corp. mine; Eddy Co., NM). *Analytical data:* (IMC-2A) $^{87}Sr/^{86}Sr$ = 0.7565; Rb = 20.34 ppm; Sr = 1.34 ppm; $^{87}Rb/^{86}Sr$ = 44.15. (IMC-2B) $^{87}Sr/^{86}Sr$ = 0.8434; Rb = 24.22 ppm; Sr = 0.81 ppm; $^{87}Rb/^{86}Sr$ = 87.27. (IMC-2) K = 18.558%; $^{40}Ar^*$ = 0.01623 ppm; $^{40}Ar^*/\Sigma^{40}Ar$ = .282. *Comments:* Material was hand picked but did not reach 100% purity.

leonite (2A) (Rb-Sr)78 m.y.
leonite (2B) (Rb-Sr)109.6 m.y.
leonite (2B) (K-Ar)12.6 ± 0.5 m.y.

3. *IMC-3A, 3B* — Rb-Sr, K-Ar

Langbeinite (32°25'N,103°56'W; International Minerals Corp. mine, Eddy Co., NM). *Analytical data:* (IMC-3A) $^{87}Sr/^{86}Sr$ = 1.9749; Rb = 76.01 ppm; Sr = 0.48 ppm; $^{87}Rb/^{86}Sr$ = 515.76. K = 18.823%; $^{40}Ar^*$ = 0.3054 ppm; $^{40}Ar^*/\Sigma^{40}Ar$ = .878. (IMC-3B) $^{87}Sr/^{86}Sr$ = 4.6044; Rb = 100.32 ppm; Sr = 0.30 ppm; $^{87}Rb/^{86}Sr$ = 1337.92. K = 18.473%; $^{40}Ar^*$ = 0.2534; $^{40}Ar^*/\Sigma^{40}Ar$ = .894. *Comments:* Sample 3A is green and sample 3B is pink. Both are very pure.

langbeinite (3A) (Rb-Sr)173 m.y.
langbeinite (3B) (Rb-Sr)205 m.y.
langbeinite (3A) (K-Ar)220 ± 7 m.y.
langbeinite (3B) (K-Ar)188 ± 6 m.y.

4. *IMC-4* — Rb-Sr, K-Ar

Kieserite (32°25'N,103°56'W; International Minerals Corp. mine, Eddy Co., NM). *Analytical data:* $^{87}Sr/^{86}Sr$ = 0.7565; Rb = 9.26 ppm; Sr = 1.91 ppm; $^{87}Rb/^{86}Sr$ = 14.07. K = 4.177%; $^{40}Ar^*$ =

0.03060 ppm; $^{40}Ar^*/\Sigma^{40}Ar$ = .667. *Comments:* Sample contains minor amounts of impurities (halide?), possibly including some clay.

kieserite (Rb-Sr)260 m.y.
kieserite (K-Ar)103 ± 4 m.y.

5. *IMC-5A, 5B* Rb-Sr, K-Ar
Sylvite (32°25'N,103°56'W, International Minerals Corp. mine, Eddy Co., NM). *Analytical data:* (IMC-5A) $^{87}Sr/^{86}Sr$ = 1.1296; Rb = 66.37 ppm; Sr = 1.21 ppm; $^{87}Rb/^{86}Sr$ = 165.28. (IMC-5B) $^{87}Sr/^{86}Sr$ = 2.4056; Rb = 62.84 ppm; Sr = 0.313 ppm; $^{87}Rb/^{86}Sr$ = 676.8. K = 52.802%; $^{40}Ar^*$ = 0.6940 ppm; $^{40}Ar^*/\Sigma^{40}Ar$ = .905. *Comments:* Sample 5A contains some halite. Sample 5B is 100% sylvite.

sylvite (5A) (Rb-Sr)180 m.y.
sylvite (5B) (Rb-Sr)177 m.y.
sylvite (5B) (K-Ar)180 ± 6 m.y.

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