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K-Ar age of the Tin-bearing Pegmatite in Sungyeong Mine

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Abstract : A muscovite and a sericite altered from plagioclase taken from the Sungyeong tin-bearing pegmatite near the Sangdong mine are dated by K-Ar method. The muscovite and the sericite yield 1546.94±29.4Ma and 187.80±4.19 Ma, respectively.

The muscovite age can be assumed to become younger than the previously reported K-Ar muscovite ages of the pegmatites around this area, because radiogenic argon in the muscovite could be partially lost by the heat of later hydrothermal activities which caused the plagioclase to be sericitized in the Jurassic time (about 190 Ma).

INTRODUCTION

Tin mineralization in South Korea is restricted in space and time ; the distribution of the tin mineralization has been spatially recognized within pegmatite dikes of the Precambrian metasedimentary rocks in the Taebaegsan Mineralized Belt and temporally in Precambrian time.

However, the isotopic age of the tin-mineralization in the area has not been reported yet, although some K-Ar age data on muscovites of the pegmatite dikes around tin-deposits have been reported about 1,790±18Ma in Sangdong area (Yun, 1985), and 1,754±53Ma in Yeonhwa area (Yun and Silberman, 1979), respectively.

Therefore, a muscovite and a sericite samples were selected from the tin-bearing pegmatite at Chillangri, Sangdong-Eup and dated by K-Ar method, and the result will be reported in this paper.

GEOLOGICAL BACKGROUND

The Sungyeong tin bearing pegmatites are distributed in the southern part of the so-called "Hambaeg Syncline" where the Cambro-Ordovician sedimentary rocks of the Joseon Supergroup overlie unconformably the Precambrian metasedimentary rocks of the Yulri series(Fig. 1).

The pegmatites have intruded into these metasedimentary rocks in many places, but not into the Cambro-Ordovician sedimentary rocks. And these pegmatites striking in N 40 °-70 ° W and N 30 °-70 ° E have been extended from 10 to several hundred meters with variable width ranging 0.5-20 meter. This fact strongly suggests that the pegmatites dikes had intruded already before the Cambro-Ordovician sedimentary rocks were doposited.

In addition, some of the pegmatites around the Naedeog and Nonggeori granites are gradually changed into the granite in mineral and chemical compositions (Yoon, 1984 ; Yun, 1985). The major rock forming minerals of the pegmatite are quartz, plagioclase, alkali-feldspar and muscovite, and accessory minerals are biotite, tourmaline, apatite, cassiterite, garnet and sericite. Particularly the plagioclase among them is altered to sericite, suggesting that later hydrothermal activities have occurred.

K-Ar age data on the muscovites from the Naedeog and Nonggeori granites and the pegmatites almost coincide with each other in error limits(Table 1). This fact strongly indicates that these granites and the pegmatites have the same petrogenesis.

*KIER

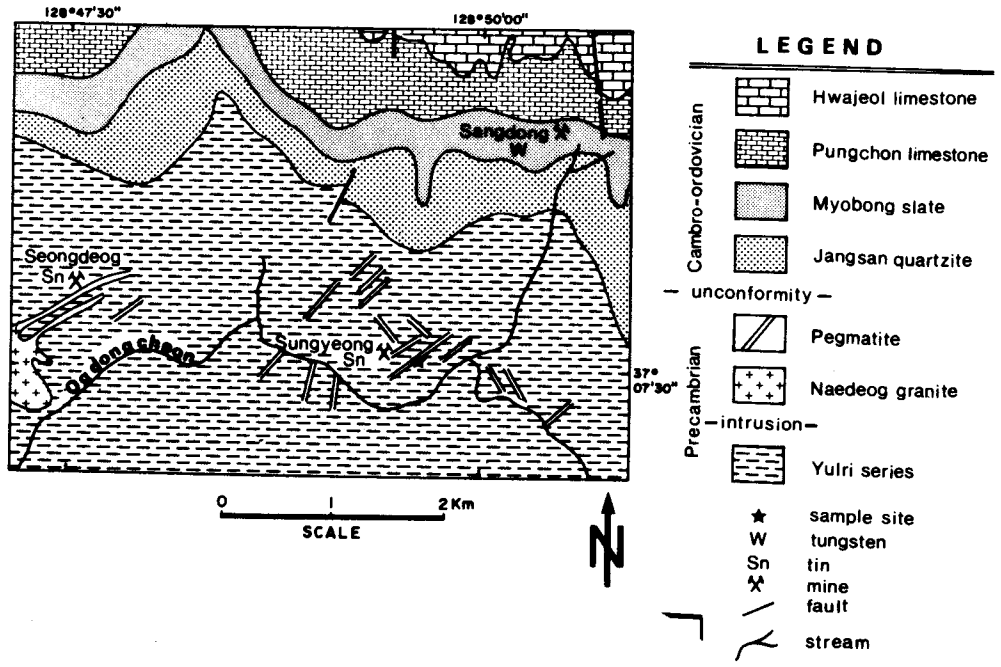

Fig. 1. Map showing general geology of the Tinbearing pegmatite at Sungyeong near Sangdong mine.

Table 1. Geochronolgy of the Precambrian granitic rocks and mineralization in the Sangdong area.

intrusives	dating methode	whole rock / minerals	age (Ma)	rererence
	K−Ar	muscovite	1762	Farrar et al., 1978
Nonggeori	K−Ar	muscvite	1530	Ueda, 1969
Granites	Rb−Sr	Whole rock	1596±188	Lee, 1988
	K−Ar	muscovite (6)*	1767±23	Yun, 1985
Naedeogri Granites	K−Ar	muscovite(5)*	1731±20	Yun, 1985
Pegmatites (Sangdong)	K−Ar	muscovite (4)*	1790±18	Yun, 1985
Pegmatites (Yeonhwa)	K−Ar	muscovite (2)*	1749±53	Yun and Silberman, 1979
Bonguje	K−Ar	muscovite in W-bearing quartz vein	168	Clark, 1981
Sangdong	K−Ar		81−85	Clark, 1981
				Farrar et al., 1978
Imog Granites	K−Ar	biotite	193	Kim and Kim, 1978
		biotite (2)*	93± 1	Yun, 1985
Geodo Granites	K−Ar	biotite	107	Kim, 1971
	K−Ar	biotite (5)*	108.6± 1	Yun, 1985

*The figures of brackets are number of the age data, and the age is an average of them.

Table 2. K−Ar age data of the on the muscovite and sericite of the Sn bearing pegmatite in Sungyeong.

Sample No.	Name of sheet (1 : 50,000)	National grid	Mineral dated	K (%)	40 Ar Rad 10^{-6}Mole/G	(%)	Age (Ma)	Average age (Ma)
TB−1	Taebaeg	1848/4033	muscovite	8.71	38.62170	99.09	1529.39±36.7	1546.94±29.4
					37.61070	99.43	1564.49±22.1	
TB−2	Taebaeg	1848/4033	sericite	4.82	1.66695	94.38	189.16±5.29	187.80±4.19
					1.64178	65.96	186.44±3.09	

The name of the sheet (1 : 50,000) is taken from newly edited topographic map.

SAMPLE DESCRIPITION AND PREPARATION

One muscovite and one sericite altered from feldspar were collected from the tin-bearing pegmatite at Chillangri, Sangdong Eup.

Both of the minerals are coarse grained 2-3cm in diameter and associated with quartz, alkali-feldspar, tourmaline, cassiterite, etc.

The muscovite was ground and cleaned in ultrasonic cleaner, and dried and sieved to 40-60 mesh in size. And all impurities were removed through the magnetic separator in 1.4 Ampere, 25° forward slope and 15° side slope. The sericite was only ground to fine, 80-100 mesh in size. Both samples were analyzed by a NUCLIDE'S SGA 6″-60° sector type mass spectrometer at KIER.

RESULTS AND DISCUSSIONS

The analytical results are listed in Table 2. The muscovites give ages of the Precambrian, 1529.39±36.7 Ma and 1564.49±22.1 Ma, respectively. These ages are a little younger than those of pegmatites around this area (Yun, 1985), but very similar to the age of the Nonggeori granites of Ueda's (1969)(Table 1).

On the other hand, the sericities samples yield ages of the Jurassic time, 189.16±5.29 Ma and 186.44±3.09 Ma, respectively. These ages are a little older than that of muscovite from the tungsten bearing quartz vein at Bongu-jae (Clark, 1981) (Table 1).

In comparison with the previous K-Ar age data (about 1,760±20Ma) on muscovites from the pegmatites in this area, the above results are much younger than those of them.

In consequence, these results can be concluded as follows

Initially the tin bearing pegmatites have been intruded into the Precambrian metaseimentary rocks at about 1800±100 Ma which is a little older than K-Ar muscovite ages of this area. Because the emplacement age of the pegmatites should be older than K-Ar muscovite age of them, owing to difference in retention temperature of Rb-Sr whole rock age(720°±100°)and K-Ar muscovite age (350°±50°) (Dodson, 1973 ; Purdy and Jäger, 1976 ; Wagner et al., 1977 ; Harrison et al., 1979).

And then the plagioclase in the pegmatites could have been sericitized by later hydrothermal activities at about 190 Ma, and the radiogenic argon gas in the muscovite could be partially lost by the heat during the hydrothermal stage.

These effect would cause the age of the muscovite (about 1550±30 Ma) to be younger a little than the previously reported age of it (about 1760±30 Ma).

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順鏡 含朱錫 페그마타이트의 K－Ar年齡

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要　約：上東 鑛山 周圍에 分布되어 있는 順鏡 含朱錫페그마타이트에서 白雲母 및 斜長石으로 부터 變質된 絹雲母를 採取하여, K-Ar法으로 各 鑛物의 年齡을 測定하였다. 白雲母는 1546.94±29.4 Ma, 그리고 絹雲母는 187.80±4.19 Ma로 밝혀졌다.

이 白雲母의 年齡은 이 地域一帶에 分布되어 있는 다른 페그마타이트 內의 白雲母의 K-Ar 年齡보다는 젊은 것으로 나타났는데, 이는 페그마타이트內에 있는 斜長石이 絹雲母化될 때(約 190Ma 頃), 熱水의 熱에 依하여 白雲母內의 放射性源 알곤(40 Ar)이 一部 流失된 때문이라고 解釈된다.