

K-Ar Whole Rock Ages of the Rhyolitic Rocks at Punggog in the Jangseong Sheet*, Taebaegsan Area

Myung-Shik Jin**, Sahng-Yup Kim** Hyo-Joon Seo** and Seong-Jae Kim**

ABSTRACT : Two rhyolitic rocks were taken at Punggog of the Jangseong sheet in the Taebaegsan mineralized area and isotopically dated by K-Ar whole rock method. One is a rhyolite which gives 62.69 ± 1.15 Ma*** and the other is a rhyolitic tuff which gives 51.67 ± 6.64 Ma, respectively.

Generally K-Ar whole rock ages of the volcanic rocks can be assumed to be the formation age of them, if there is no geological criterion of secondary effects. But the two rhyolitic rocks were slightly hydrothermally altered and the age the rhyolitic tuff is a little younger than that of the rhyolite. However, there is no geological criterion to show any big hiatus between them in field, yet. Therefore, the age data would be interpreted as that the rhyolitic rock mass has been probably extruded at about 60 Ma, a little older than 60 Ma, in the area. The ages of them probably appear to be secondary ages after the alteration. This fact well coincides with the K-Ar whole rock age of quartz-porphyry (57.25 ± 0.89 Ma) distributed near the 1st Yeonhwa Pb-Zn mine (Park et al., personal comm.), because the quartz-porphyry looks to be a product of hydrothermal alteration of the volcanic rock.

INTRODUCTION

In fact, the Cretaceous to Tertiary igneous activities have been reported to occur mostly in the Cretaceous Gyeongsang Basin, but actually the igneous activities widely occurred, in time and space, in the southern part of the whole Koeran Peninsula including the Taebaegsan mineralized area (Lee et al., 1987). Accordingly the Cretaceous to Tertiary volcanics are much more widely distributed than reported so far, and geochronologically seem to show various ages. However, the Cretaceous to Tertiary volcanic rocks distributed in the Taebaegsan mineralized area have been not so much geologically surveyed and isotopically studied yet.

There are a few published isotopic data of the Cretaceous to Tertiary volcanic rocks distributed in the Taebaegsan mineralized area. One is rhyodacite distributed in Uljin area, which yielded 49.3 ± 2.0 Ma (Yun and Silberman, 1979), and other is a rhyolitic rock distributed in the Uljin Pb-Zn mine which yielded 45.1 ± 2.3 Ma (Kim and Lee, 1983), another is a quartz porphyry distributed near the 1st Yeonwha Pb-Zn mine, which yielded 57.25 ± 0.89 Ma (Park et al., personal communication)(Table 1).

Therefore, two rhyolitic rock samples were taken at Punggog in the Taebaegsan mineralized area and isotopically dated by K-Ar whole rock method, and the result is reported here.

GEOLOGICAL BACKGROUND

The punggog area is widely overlain by the Precambrian Hongjesa Granites which intruded the Precambrian metasedimentary rock of the Yulri Group, and the Yulri Group being mostly composed of

* The name of the sheet is from new edition of 1:50,000 topographic map.

**Geochemical Exploration Division, Korea Institute of Energy and Resources P.O. Box Guro 98, Seoul, Korea

*** It is recalculated age by the new decay constant of K(1976).

Table 2. Chemical composition and normative minerals of the volcanic rocks distributed at Punggog in the Jangseong sheet, Taebaegsam area.

sample No.	major elements(%)													total
	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	-H ₂ O	LOI	
JS-1	71.84	0.05	14.52	0.35	1.32	0.06	0.63	1.14	1.85	5.68	0.07	0.13	2.26	99.90
JS-2	71.54	0.05	15.01	0.22	1.57	0.07	0.54	1.15	2.74	5.31	0.12	0.07	1.68	100.00
sample No.	normative minerals(%)										total			
	Q	Co	Or	Ab	An	Hy	Mt	Il	Ap					
JS-1	36.06	3.51	34.43	16.06	5.33	3.83	0.52	0.10	0.17		100.00			
JS-2	31.62	3.00	31.92	23.58	5.00	4.16	0.32	0.10	0.29		100.00			

Table 3. K-Ar whole rock ages of the volcanic rocks distributed at Punggog in the Jangseong sheet, Taebaegsan area

sample No.	* name of sheet	locality (nat'l grid)	rock type	K (%)	⁴⁰ Ar rad 10 ⁻³ (Mol/G)	⁴⁰ Ar rad (%)	age (Ma)
JS-1	Jangseong	2158/4011	rhyolite	4.73	5.2325	84.92	62.69±1.15
JS-2	Jangseong	2150/4017	rhyolitic tuff	4.40	3.9999	77.39	51.67±6.64

*The name of the sheet are from the new edition of topographic map(1 : 50,000).

agglomerates or breccias comprising angular to sub-angular rhyolitic blocks occur in places. The rhyolite (JS-1) is composed of pinkish feldspar, transparent volcanic quartz and microcrystalline mafic silicates, and the rock often show flow structures of banding or laminations. The mafic silicates are also slightly altered to chlorites or sericites.

The two rocks are chemically analyzed by Mr. Kim, S. J., and normative minerals are made from the chemical results of them (Table 2). The two whole rock samples are crushed and ground to powder, and chemically analyzed for potassium (K) first, by AAS. The isotopic compositions of argon (Ar) are analyzed by a NUCLIDE's SGS 6'-60 Sector type mass spectrometer at the Geochemical Exploration Division, KIER.

RESULTS AND DISCUSSIONS

The K-Ar isotopic analysis for the two rhyolitic rocks are listed in Table 3. One sample JS-1 is a rhyolite gives an age of 62.69±1.15 Ma, and the other JS-2 which is 51.67±6.64 Ma, respectively. In particular, the latter shows a large error limit with

more than 10% in age, resulting from the heterogeneity of the sample (it contains some rhyolitic lapilli, as described before). In addition, some later hydrothermal activities after the solidification of them could affect the age of them younger a little than the primary ages. In comparison with the previous K-Ar whole rock age data of volcanic rocks around the surveyed area (Table 1), the data are very similar to those of quartz porphyry (Park *et. al.*, personal comm.) and are older a little than those of rhyodacite and rhyolitic rock (Yun and Silberman, 1979 ; Kim and Lee, 1983).

Consequently, the data mentioned above, suggest that the igneous activities including volcanism and plutonism have successively continued up to the Late Cretaceous or the Tertiary in the Taebaegsan Mineralized Belt.

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Table 1. K-Ar whole rock age data of the volcanic rocks distributed in the Taebaegsan mineralized belt

sample No.	*name of sheet	locality (nat'l grid)	rock type	K (%)	⁴⁰ Ar rad 10 ⁻⁹ (Mol/G)	⁴⁰ Ar rad (%)	age (Ma)	reference
Y-6	Jugbyeon		rhyodacite	5.91	5.124	70.00	49.30±2.0 ** (50.8±2.0)	Yun and Silberman, 1979
119	Jugbyeon		rhyolitic rock	4.42	9.465	84.75	45.10±2.3	Kim and Lee, 1983
Y-2	Jangseong	2019/3965	quartz-porphyry	7.90	7.963	96.64	57.25±0.9	Park <i>et al.</i> , personal communication

*The name of the sheet is from new edition of 1 : 50,000 topographic map.

**It is recalculated age by the new decay constant of K (1976).

injection gneisses, mica schists and quartzites remains as a small patch around the Punggog area (Yun, 1967)(Fig. 1) And the Donghwalri formation of Cretaceous age unconformably overlies the Hongjesa Granites and is overlain by the volcanic rocks. The Donghwalri Formation is mostly composed of greyish blue pebbles and cobbles and quartzite pebbles etc. ranging a few cm to several ten cm, rarely up to more than 1 m, in size. The volcanic rocks mostly comprise tuff, rhyolite and rhyolitic tuff, which is called the Heungeon Formation.

SAMPLE DESCRIPTION AND PREPARATION

The volcanic rocks are mostly composed of rhyolitic tuffs, agglomerates or breccias and rhyolites. The rhyolitic tuff (JS-2) is composed of angular to sub-angular compact rhyolite lapilli which show flow bandings or laminations, and it contains pinkish feldspar, transparent volcanic quartz and microcrystalline mafic silicates. The mafic silicates are slightly altered to chlorites or sericites. The rhyolitic

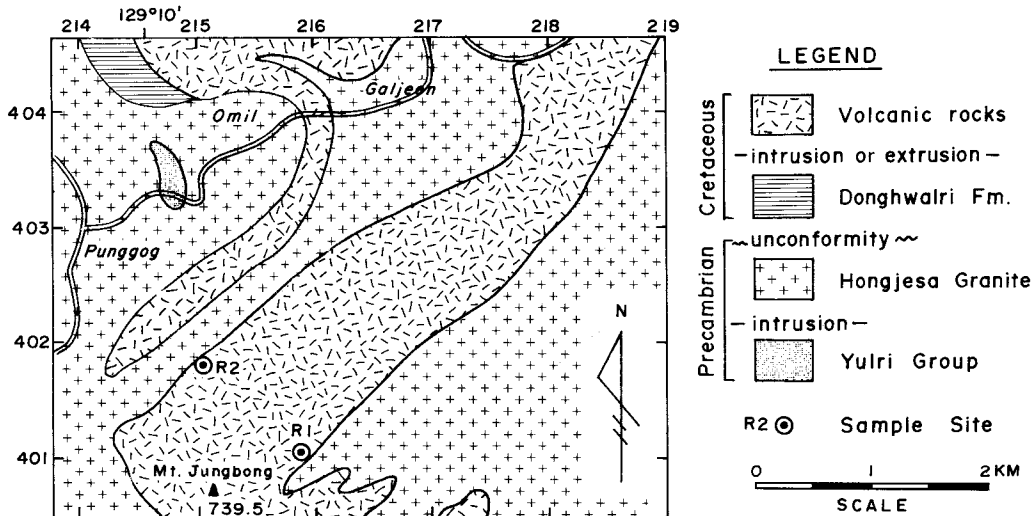


Fig. 1. Geologic and sample location map of Punggog area.

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太白山地域 長省圖幅內 豊谷에 分布되어 있는 流紋岩質岩의 K-Ar 全岩年齡

陳明植, 金相燁, 徐孝俊, 金星載

要約: 太白山 鑛山帶內 長省圖幅의 豊谷一帶에서 採取한 두 個의 流紋岩類를 K-Ar 全岩法으로 年齡測定하였다. 그 中, 流紋岩은 $62.69 \pm 1.15\text{Ma}$, 流紋岩質凝灰岩은 $51.67 \pm 6.64\text{Ma}$ 로 確認되었다.

一般的으로 火山岩의 K-Ar 全岩年齡은, 地質學的으로 二次的 影響을 받지 않았다면, 火山岩의 形成年齡을 提示하나, 여기서 年齡測定한 두개의 流紋岩質岩은 약간 熱水變質받았고, 流紋岩質凝灰岩이 流紋岩의 年齡보다 약간 젊은 것으로 나타났다. 이들 岩石의 野外產出狀態는 整合的인 故로, 적어도 이들 두 流紋岩質岩은 約 60Ma보다 그 以前에 噴出된 것으로 判斷된다.