NOTES ON PETROGRAPHY AND ROCK-FORMING MINERALOGY (2) FIND OF A PARAGONITE-BEARING QUARTZ SCHIST FROM THE KOTU DISTRICT, EASTERN SHIKOKU.

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INTRODUCTION

From the Sanbagawa metamorphic rocks, paragonite has been described from two rock-types, namely kyanite-zoisite amphibolite of the Tonaru and Iratsu epidote amphibolite masses, presently considered as metamorphosed layered gabbro, and in a metamorphosed basaltic tuff of the Osugi basalt complex (Banno, 1964; Banno *et al.* 1976). None of them, however, is from schist in ordinary sense of words. Recently, paragonite was found in a quartz schist of the Kotu district, eastern Shikoku. This note will describe the paragonite-bearing schist.

MODE OF OCCURRENCE AND PETROGRAPHY

The rock is a block in a valley joining Okunoidani-gawa (river), a tributary of Kawada-gawa, at Ouchi from SSE direction (a valley running west of Enoki-dani, Yamakawa-machi, Tokushima Prefecture). It is thought to have derived from a quartz schist bed of the Kotu formation in the sense of Iwasaki *et al.* (1970). Fig. 1 shows the locality.

The rock is schistose quartz schist, probably metamorphosed impure chert,

common in the Sanbagawa belt. It consists of apatite, rutile, epidote, muscovite, paragonite, garnet, crossite and quartz. It is rather coarse-grained, quartz and crossite measuring about 0.5×0.2 and 1.0×0.3 mm² in thin sections, respectively. Chlorite occurs replacing crossite or as minute ir-

Fig. 1. Sample location.

Table 1 The analyses of the constituents

		Paragonite	Muscovite	garnet	Epidote	Crossite	
						core	rim
Weight percent	SiO ₂	47.3	49.7	37.4	38.8	55.4	55.6
	TiO ₂	0.04	0.19	0.07	0.03		
	Al ₂ O ₃	37.6	26.8	20.11	23.7	8.2	8.2
	FeO*	1.0	3.6	13.20	13.3	15.4	12.3
	(Fe ₂ O ₃)**		(3.2)		(14.6)		
	(FeO)**		(0.6)				
	MnO	0.02	tr	21.26	0.84		
	MgO	0.14	3.15	2.27	0.10	10.2	12.9
	CaO	0.08	tr	5.46	22.9	1.1	2.2
	Na ₂ O	6.87	0.66	—	—	7.0	6.6
	K ₂ O	1.04	10.4	—	—	—	—
Total***		94.0 ₉	94.5 ₀	99.7 ₇	99.6 ₇	97.3	97.8
Atomic ratio	O	22	22	12	12.5	23	23
	Si	6.14	6.75	3.02	3.03	7.90	7.80
	Ti	0.04	0.02	—	—	—	—
	Al	5.75	4.29	1.91	2.19	1.38	1.36
	Fe	0.11	0.41	0.89	0.78	1.83	1.44
	Mn	0.002	—	1.45	0.06		
	Mg	0.03	0.64	0.27	0.01	2.17	2.71
	Ca	0.01	—	0.47	1.92	0.16	0.33
	Na	1.73	0.17	—	—	1.93	1.78
	K	0.17	1.79	—	—	—	—

* Total Fe as FeO

** Recalculated

*** H₂O-free

regular grains and then secondary after the minerals listed above. Albite is present, but only as very tiny crystals along white mica, or along the cracks of the rock at which white mica is distorted. None of albite with comparable size as quartz has been observed, and hence albite is also a secondary phase.

The analyses of the constituent minerals by electron-probe microanalyzer are shown in Table 1. Crossite is zoned with pale violet core and deeper-violet rim, but the chemical difference between them is minor as seen in the table. Garnet is slightly zoned, and the analysis shown in

the table is at the core.

Coexistence of muscovite and paragonite makes it possible to apply two mica thermometer on the Sanbagawa schists, but it is not attempted here because muscovite contains appreciable amount, about 40 per cent, of celadonite component ($\text{Si} = 6.8$ on $\text{O} = 22$) and consideration on ternary system is necessary. Analysis recalculated in Table 2 shows that the muscovite is a phengite, consisting of strict sense muscovite $\text{K}_2\text{Al}_4\text{Al}_2\text{Si}_6\text{O}_{22}(\text{OH})_4$ and celadonite $\text{K}_2\text{Al}_2(\text{Mg}, \text{Fe}^{2+})_2\text{Si}_8\text{O}_{22}(\text{OH})_4$, with considerable Fe^{3+} substituting octahedral Al ($\text{Fe}^{3+}/(\text{Fe}^{3+} + \text{Al})$ in octahedral site is 0.32).

Table 2 Recalculation of muscovite analysis

	Table 1			Muscovite	Celadonite	Observed
Si	6.75	6.75 1.25	8.00	6.0	8.0	6.75
Al	4.29			2.0 4.0		1.25
Fe	0.41	Fe ³⁺ Fe ²⁺	3.04 0.30 0.11		2.0	3.34
Mg	0.64		0.64		2.0	0.75
Na	0.17					
K	1.79		1.96	2.0	2.0	1.96
Formula	(K, Na) _{1.06} (Mg, Fe) _{0.75} (Al, Fe ²⁺) _{3.34} (Al _{1.25} Si _{6.75})O ₂₂ (OH) ₂					

Characteristics of the assemblage of this schist is the absence of primary albite and chlorite. Search for paragonite in quartz schists with similar assemblage may reveal more occurrences of paragonite in future.

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REFERENCES

- Banno, S. (1964) Petrologic studies on Sanbagawa crystalline schists in the Bessi-Ino district, central Shikoku, Japan. *Jour. Fac. Sci. Univ. Tokyo, Sec. II*, **15** 203-319
- Banno, S., Yokoyama, K., Iwata, O. and Tera-shima, S. (1976) Genesis of epidote amphibolite masses in the Sanbagawa metamorphic belt of central Shikoku. *Jour. Geol. Soc. Japan*, **82**; 199-210
- Iwasaki, M., Hara, I., Nureki, T., Bando, Y., Uchibayashi, S., Yokota, Y., Takahashi, S., Matsuki, M. and Hoshina, T. (1970) Report of Mineral. Explo. Corp. "Yoshino-gawa", Ministry of Intern. Trade & Industry.

岩石学・造岩鉱物学ノート (2)

四国東部高越地域からパラゴナイトを伴う石英片岩の発見

平村 まき子

徳島県高越地域の石英片岩にはパラゴナイトを含むものが産する。産地は徳島県山川町の榎谷部落の西方を流れ、大内では川田川の上流奥野井谷に合流する沢の上流で、標高 500 m の地点で、標本は転石である。その岩石は石英+ルチル+クロス閃石+ざくろ石+白雲母+パラゴナイト+緑れん石の鉱物組合せを持つ。また、この岩石の白雲母はセラドナイト成分を約 40% 含む。