A new member of the Kurosegawa tectonic zone was found in the serpentinite near Kochi city. They are high P and low T schists derived from basalt and chert.

Three metamorphic events can be deciphered in the high-pressure schists, based upon the texture and mineral paragenesis: first, low P metamorphism at intermediate- to high-grade, second, high P and low T metamorphism of the jadeite-glaucophane facies and the third, retrograde crystallization of the second stage high P schists within the stability field of lawsonite+pumpellyite+glaucophane. Further, the formation of analcime replacing jadeite took place. The second and third metamorphism can be distinguished on pyroxene mineralogy that jadeite+quartz was stable in the second, but albite+quartz+aegirinejadeite in the third stage of metamorphism.

Not all of the high P and low T schists had suffered low P metamorphism before they were metamorphosed by the high P one. Some basaltic rocks directly changed to high P and low T schists.

Two muscovites in the schists give K-Ar ages of 208-240 m.y., and a relic igneous biotite, being partly replaced by chlorite, gives 225 m.y. of K-Ar age. These values are different not only from those of the Sanbagawa schists, but also from the other members of the Kurosegawa zone.

INTRODUCTION

The Kurosegawa tectonic zone is a fault zone in the Chichibu terrain in southwest Japan. It runs in EW direction in the middle subbelt of the Chichibu terrain (Yamashita, 1957) and accompanied by a large amount of serpentinite and blocks exotic to the neighbouring Chichibu formation, measuring from a few meters to several kilometers. Large blocks are lenseshaped and surrounded by serpentinite, but small blocks are xenoliths in serpentinite. A variety of rock-types have been recognized among exotic blocks: unmetamorphosed Silurian and Devonian, granite and gneiss (426 m.y., Rb-Sr, Nohda, 1973), amphibolite, garnet amphibolite and basic granulite. Basic and pelitic schists of albite-epidote amphibolite facies (429 m.y., K-Ar, Maruyama and Ueda, 1975) also occur.

Several years ago, we found that
Fig. 1. Geological map of the Ino-Engyoji area.
another type of exotic blocks occur in serpentinite of the Kurosegawa zone of Shikoku. It includes high P and low T schists among which are jadeite-glaucophane schists. In the following, we intend to describe the mode of occurrence, petrography and K-Ar ages of the high P and low T schists xenoliths in detail.

MODE OF OCCURRENCE

A geologic map of the Kurosegawa zone near Kochi city in Shikoku, is shown in Fig. 1. Members constituting the tectonic zone are divided into two groups on the basis of their scale; one is called as tectonic unit and is usually larger than 1.5 x 0.3 square kilometer in size, and the other smaller than this size is called as tectonic block herein. Tectonic units consist of the Triassic Kochigatani, Permian Takaoka, Silurian Yoko-
kurayama formations, and the Ino formation of unknown age as shown in Fig. 1. The former four are weakly metamorphosed in some places, but practically unmetamorphosed in others. The Ino formation suffered glaucophanitic metamorphism (Banno, 1964, Nakajima et al., in preparation). Serpentinite is one of the major constituent rock-types of the zone in this area. In some places it forms large masses, but in others, it forms separate belts intruded into fault and are several meters wide, continuing for more than several kilometers. The faults bordering tectonic units or large tectonic blocks are very often intruded by serpentinite. Small tectonic blocks, measuring less than 1 m³ of amphibolite, albite-epidote amphibolite, basic granulite, garnet amphibolite, gneiss and glaucophane schists are always enclosed by serpentinite.

In the area north of the cities of Ino and Kochi, large serpentinite mass, extending westwards for more than 18 kilometers is in contact with mudstone, accompanied by a small amount of chert, sandstone and greenstone, which is probably a part of the Ino formation (Katto and Kawasawa, 1958). The contact between the serpentinite and the sedimentary sequence is concordant at some places, but discordant at others. Several roof pendants of the Ino formation, one of them measuring about 0.04 km², were mapped in the serpentinite.

The xenoliths of the high P and low T schists occur in the northern part of the large serpentinite mass referred above. The largest of the blocks measures 100 m³, but they are usually about 0.5 m³ (Fig. 6).

PETROGRAPHY

The high P and low T schists so far collected are metabasites and metachert. Although all the schists examined contain high-pressure minerals, such as jadeite, glaucophane, chloromelanite and lawsonite, a few types of original rocks could be deciphered. They are pillow lava, hyaloclastite and massive lava on the one hand, and greenschist and amphibolite on the other.

The schists derived from volcanics preserve augite and biotite as relic minerals, and hyaloclastic texture can be seen under the microscope. These metavolcanics suffered high P and low T metamorphism without having intermediate stages of low-pressure metamorphism to be mentioned later.

High P and low T metamorphics derived from amphibolite is medium- to coarse-grained and melanocratic with amphibole as dominant mafic phase. Fresh rock is commonly bluish or greenish black. A continuous series of texture is observed between the two extreme cases: one being
poor in high-pressure minerals and the other mostly consisting of them.

Pale-green actinolite coexisting with hornblende, green and brown, and Ca-rich clinopyroxene are on the way being replaced by alkali amphibole (Fig. 2), but plagioclase is exclusively albite (less than \( X_{An}=0.01 \)) that sometimes includes lawsonite, suggesting its derivation from Ca-bearing plagioclase.

![Fig. 2. Replacing texture of actinolite by alkali amphiboles. Actinolite is partly replaced by magnesioriebeckite along cleavage or crack, which in turn is thoroughly mantled by parallel-symmetric glaucophane, thereby suggesting that magnesioriebeckite is not equilibrated with matrix minerals. Whenever magnesioriebeckite appears, it shows nonequilibrated texture with matrix minerals as in this sample.](image)

Thus, at least two stages of metamorphic recrystallization are recognized in some of the high P and low T schists. The mineral assemblages formed by high P and low T metamorphism will be described first, and the relationships between these two stages of metamorphism will be discussed later.

Mineral assemblages of metabasites formed by high P and low T metamorphism are as follows:

(1) lawsonite + glaucophane + stilpnomelane + jadeite + aegirinejadeite + albite + quartz
(2) lawsonite + pumpellyite + jadeite + aegirinejadeite + albite + quartz
(3) lawsonite + pumpellyite + glaucophane + aegirinejadeite + albite + quartz
(4) lawsonite + pumpellyite + glaucophane + jadeite + aegirinejadeite + salite + chlorite + albite + quartz
(5) lawsonite + pumpellyite + croscite + epidote + albite + quartz
(6) lawsonite + pumpellyite + chloromelanite + chlorite + albite + quartz
(7) lawsonite + pumpellyite + glaucophane + albite + quartz
(8) lawsonite + glaucophane + stilpnomelane + albite + quartz
(9) lawsonite + pumpellyite + glaucophane + chloromelanite + microcline + albite + quartz
(10) lawsonite + glaucophane + albite
(11) lawsonite + pumpellyite + glaucophane + albite
(12) lawsonite + pumpellyite + glaucophane + albite + aegirinejadeite
(13) lawsonite + glaucophane + albite + aegirinejadeite
(14) pumpellyite + chlorite + albite

Partial assemblages of (7) are common. Assemblages (10)-(14) are free of quartz. Sphene, apatite, white mica (phengite so far identified), calcite and opaque minerals may be added to the above assemblages. Opaque minerals were identified for assemblages (4), (5), (6) and (9). Pyrite, chalcopyrite and sphalerite are present, but hematite and rutile have not been observed. Analcime is sometimes observed around jadeitic pyroxene.

In the metamorphosed chert, following assemblages were observed:

(15) lawsonite + glaucophane + graphite + quartz (mode 50\% ±) + albite
(16) glaucophane + graphite + quartz (mode 90\% ±) + albite

Aragonite was sought by staining with Feigl's solution, but not detected except as veinlet minerals in serpentinite.

The assemblages listed above include
some metastable ones such as (1), (2) and (4), and it is apparent that not all of them are isofacial. These problems will be discussed below from the viewpoint of pyroxene mineralogy.

There are five types of metamorphic pyroxenes in the xenoliths. The first group is augite relics derived from higher-temperature metamorphism preceded the high P and low T one and it is partly replaced by alkali amphibole. Metabasites containing the metamorphic augite relics always contain brown hornblende which is also replaced by alkali amphibole at its periphery. Therefore, such augite may be neither of igneous nor high P and low T metamorphism, but of the preceding low-pressure one in origin. The pyroxenes formed by high P and low T metamorphism are salite, jadeite and impure jadeite, chloromelanite, and aegirinejadeite. Fig. 3 shows their compositions. Jadeite and impure jadeite are jointly called jadeite in

the list of mineral assemblages. A group of pyroxenes has compositions covering both the impure jadeite and aegirinejadeite fields as defined by Essene and Fyfe (1967), but they are jointly called aegirinejadeite, because they were formed by the same process, and their majority belong to aegirinejadeite, as well as it is too artificial to separate them into two groups. Chloromelanite and salite form distinct groups, both chemically and genetically.

Jadeite appears in the matrix or vein. It is in direct contact with quartz in some cases, but they usually reacted with quartz resulting in the formation of albite or aegirinejadeite. Two types of reaction texture can be distinguished. First type is shown in Fig. 4, in which we see that quartz and jadeite occur 0.5 mm apart, but not in direct contact. Between them are the pseudomorph after pyroxene consisting of aggregates of albite and less jadeitic pyroxene, which are again armoured by fresh albite without inclusions. The less jadeitic pyroxene is too fine-grained to determine the exact composition. However, it was confirmed that it has some amounts of Ca and Fe by an electron-probe microanalyzer. Jadeite sometimes occurs in the aggregates of pyroxene pseudomorph as irregular crystals being replaced partly by mesh-like veinlets of albite, and partly by high-refracting mineral, probably less jadeitic pyroxene. This texture can be explained by the reaction between jadeite and quartz outside their stability field. Another example of reaction is illustrated in Fig. 5, where jadeite is mantled by aegirinejadeite. The boundary between them is chemically sharp. This texture can also be explained by the reaction mentioned above.

In some places, however, jadeite is in contact with quartz. Lawsonite, pum-
pellyite and glaucophane never show retrograded textures. Therefore, we think that the breakdown of jadeitic pyroxene took place within the stability field of the assemblage lawsonite + pumpellyite + glaucophane, in other words, probably in the aragonite field (Brown, 1977).

Chloromelanite occurs in the matrix or in the vein, the latter composed mainly of albite and quartz with lesser amount of glaucophane, pumpellyite and lawsonite. Chloromelanite is strongly zoned with the core richer in augite and poorer in acmite, and the rim with low augite and high acmite contents, i.e., jadeite content does not vary in the zoned chloromelanite.

Salite coexists with lawsonite, pumpellyite and glaucophane. It has low Al₂O₃ and TiO₂, and high CaO contents (Table 1). It occurs in the thin section containing jadeite-aegirinejadeite overgrowth, but salite occur only in the isolated pool which consists of salite, lawsonite, pumpellyite and glaucophane, and probably not equilibrated with jadeite and glaucophane in the matrix, although it is a metamorphic pyroxene.

As discussed above, jadeitic pyroxene shows texture of reaction with quartz. Then, by eliminating the assemblage of later reaction, following three groups of mineral assemblages are distinguished. Lawsonite, pumpellyite and glaucophane appears, from the texture, to coexist in all these groups of assemblage.

1. jadeitic pyroxene (jadeite mol. more than 70%) + quartz
2. albite + quartz without Na-pyroxene
3. albite + quartz + Na-pyroxene
(jadeite mol. less than 30%)

It is, therefore, concluded that high P and low T schists formed at different P-T conditions occur as xenoliths in serpentinite.

The mineral assemblages probably formed before high P and low T metamorphism are as follows:

(17) actinolite + calcic plagioclase
(18) actinolite + hornblende (blue green) + calcic plagioclase
(19) hornblende (green) + calcic plagioclase
(20) hornblende (brownish green) + calcic plagioclase
(21) hornblende (brownish green) + augite + calcic plagioclase with or without ilmenite and magnetite.

These assemblages are observed in rocks having high-pressure minerals, and an ambiguity remains as to the stability of the assemblage. The presence of calcic plagioclase is inferred for the texture that coarse-grained albrite (X_{An} ≤ 0.01) often contain lawsonite inclusions. Thus, the An content of alleged plagioclase is uncertain. Representative che-

<table>
<thead>
<tr>
<th>Sp. No. Assemblage</th>
<th>SN74010104</th>
<th>SN74010108</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jd</td>
<td>Aug-Jd</td>
</tr>
<tr>
<td></td>
<td>Jd</td>
<td>Aug-Jd</td>
</tr>
<tr>
<td>SiO₂</td>
<td>58.3</td>
<td>56.1</td>
</tr>
<tr>
<td>ZrO₂</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>18.5</td>
<td>15.0</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>FeO</td>
<td>4.50%</td>
<td>4.56%</td>
</tr>
<tr>
<td>MnO</td>
<td>0.04</td>
<td>0.01</td>
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<tr>
<td>MgO</td>
<td>4.97</td>
<td>4.22</td>
</tr>
<tr>
<td>CaO</td>
<td>3.47</td>
<td>3.24</td>
</tr>
<tr>
<td>Na₂O</td>
<td>11.5</td>
<td>12.1</td>
</tr>
<tr>
<td>K₂O</td>
<td>0.60</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>100.08</td>
<td>100.13</td>
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</table>

Table 2. Representative microprobe analyses of calciferous amphiboles of the preceding metamorphism

<table>
<thead>
<tr>
<th>Sp. No. Assemblage</th>
<th>SN74010101</th>
<th>SN74010114</th>
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<tr>
<td></td>
<td>Act</td>
<td>3b</td>
</tr>
<tr>
<td></td>
<td>Act</td>
<td>b0</td>
</tr>
<tr>
<td>SiO₂</td>
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<td>55.3</td>
</tr>
<tr>
<td>ZrO₂</td>
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<td>0.13</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>3.05</td>
<td>2.81</td>
</tr>
<tr>
<td>Fe₂O₃</td>
<td>9.99</td>
<td>14.1</td>
</tr>
<tr>
<td>MnO</td>
<td>0.89</td>
<td>0.73</td>
</tr>
<tr>
<td>MgO</td>
<td>17.8</td>
<td>12.5</td>
</tr>
<tr>
<td>CaO</td>
<td>12.9</td>
<td>12.5</td>
</tr>
<tr>
<td>Na₂O</td>
<td>0.17</td>
<td>0.47</td>
</tr>
<tr>
<td>K₂O</td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>99.05</td>
<td>99.24</td>
</tr>
</tbody>
</table>

Numbers of elements on the basis of 6 oxygens.

* Total Fe as FeO
** H₂O (+)=0.75, Cr₂O₃=0.018, analyst: H. Haramura.
mical analyses of calciferous amphiboles of assemblages (1) and (2) are listed in Table 2. Hornblende contain 1.8 Ca and 0.2 Na for \( \theta=23 \), which is not of high-pressure metamorphism, and should be of low-pressure one. Assemblages (1) and (2) indicate that the preceding metamorphism belongs to low-pressure type.

On these observations, we may summarize the metamorphic history of the high-pressure xenoliths as follow. First, low-pressure type metamorphism of intermediate- to high-grade took place, and its products as well as basaltic pillow lava and hyaloclastite, and chert having been intact by the low-pressure metamorphism, suffered the jadeite-glaucophane type metamorphism. Some of the schists suffered again the retrograde metamorphism within high P and low T regime. Finally, they were brought up to the ground surface being enclosed by serpentinite. Analcime around jadeitic pyroxene was probably formed on the way to the surface, or on the ground surface by weathering.

**K-Ar DATING**

Mode of mica is usually very small. Among 105 samples examined, two samples rich in muscovite, and one containing biotite were selected.

**SM74110202**: A probably metasomatized metabasite with the assemblage, jadeite + aegirinejadeite + albite + lawsonite + pumpellyite + quartz + muscovite + sphene + carbonate located from 0.3 kilometer east of Engyoji temple. Nearly pure jadeite (jadeite mol. about 99.9%) is often enclosed by aegirinejadeite as shown in Fig. 5.

**SM75011116**: Metabasite derived from the same locality as above. The rock is composed of alternation of lawsonite-rich and lawsonite-poor layers (each layer: 1 cm ±) and they are cut by pumpellyite vein containing small amounts of quartz, albite and glaucophane. The lawsonite-poor part mainly consists of brownish-green hornblende and augite, both of which are more or less replaced by glaucophane at the periphery. Plagioclase is albite with \( X_{Al}=0.01 \) and includes many fresh lawsonite tablets. The lawsonite-rich part mainly consists of lawsonite, pumpellyite, glaucophane with small amounts of impure jadeite, aegirine-jadeite, albite, quartz, muscovite, analcime and a high-refracting mineral, probably sphene. Muscovite is richer in lawsonite-rich layer than the other. Three pyroxene exist, augite formed by the preceding low P and high T metamorphism, and jadeite and aegirinejadeite, the latter replacing the former by high P and low T metamorphism.

**SM74103119**: Pumpellyite-bearing dolerite from the road side of Engyoji Pass and is a xenolith 3×2 m² in size in serpentinite (Fig. 6). Igneous mineral and subophitic texture are well preserved. Augite with \( TiO_2=0.69 \) wt% (average of 37 analyses) and \( Al_2O_3=2.30 \) wt% (same as before) contents, sericitized plagioclase, TiO₂-rich (5.5 wt %) and partly chloritized biotite are the relic igneous minerals. Existence of Ti- and Al-rich augite and Ti-rich biotite indicates that this rock belongs to alkali basalt series. Metamorphic minerals are, albite, chlorite, pumpellyite, sericite and sphene.

**K-Ar dates**: The K-Ar dates of the micas from those specimens are shown in Table 3. Muscovite from SM75011116 and SM74110202 are 208 and 240 m.y., respectively. The latter sample has no relict mineral of the preceding metamorphism and its muscovite has not any replacing texture thereby suggesting that it has been equilibrated with high-pressure minerals. Although the
208-240 m.y. old jadeite-glaucophane schists in the Kurosegawa tectonic zone

Table 3. K-Ar ages of muscovite in metabasites and biotite in metadolerite from the Kurosegawa tectonic zone, central Shikoku

<table>
<thead>
<tr>
<th>Sp. No.</th>
<th>Rock</th>
<th>Sp. wt.(g)</th>
<th>Mineral</th>
<th>K(t)</th>
<th>$^{40}\text{Ar}/^{39}\text{Ar}$</th>
<th>Age estimations(%)</th>
<th>Age(m.y.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM75011116</td>
<td>metabasite</td>
<td>0.1479</td>
<td>muscovite</td>
<td>3.84</td>
<td>0.012828</td>
<td>15.60</td>
<td>208</td>
</tr>
<tr>
<td>SM7410202</td>
<td>metabasite</td>
<td>0.7538</td>
<td>muscovite</td>
<td>7.60</td>
<td>0.014022</td>
<td>1.73</td>
<td>240</td>
</tr>
<tr>
<td>SM74103119</td>
<td>metadolerite</td>
<td>0.2932</td>
<td>biotite</td>
<td>4.52</td>
<td>0.013973</td>
<td>6.83</td>
<td>225</td>
</tr>
</tbody>
</table>

Analyst: Y. Ueda  $^{40}\text{Ar}$: radiometric argon 40, $\lambda_e=0.585\times10^{-18}\text{yr}^{-1}$, $\lambda_g=4.72\times10^{-10}\text{yr}^{-1}$, $^{40}\text{K}/^{40}\text{Ar}=1.19\times10^{-2}$ atom. %.

sample SM75011116 has relic minerals, its muscovite occur in the domains accompanying high-pressure minerals, lawsonite, pumpellyite, glaucophane and jadeite as such. Any replacing texture of muscovite has not been observed.

Consequently, radiometric ages of muscovite from them are the possible minimum ages of the high-pressure metamorphism.

Biotite in SM74103119 gave 225 m.y. It is presumably a relic igneous mineral, as discussed above, and gives the lowest estimate of the igneous crystallization age. However, the biotite is sometimes chloritized along the cleavage and crack (Fig. 6), so that the age could give the time of chloritization, that could have enhanced material migration within biotite.

**DISCUSSION**

The presence of jadeite + quartz assemblage in some of the schists xenoliths described here undoubtedly show that they belong to the typical jadeite-glaucophane facies. Some xenoliths contain albite + quartz + chloromelanite assemblage, but they also accompany lawsonite + pumpellyite + glaucophane. Brown (1977), in his review of the paragenetic relations of calc-aluminous silicates of low-temperature and medium- to high-pressure metamorphism, has demonstrated that lawsonite + pumpellyite + glaucophane assemblage is characteristic in low temperature facies of the jadeite-glaucophane type facies series, such as Franciscan and New Caledonia. We may add the Kamuikotan belt in Hokkaido (Gouchi, in preparation) as another example of the typical high-pressure schists.

In the Sanbagawa belt, although alkali amphibole including glaucophane, pumpellyite and lawsonite occur, the assemblage lawsonite + pumpellyite + glaucophane has not been observed by Miyashiro and Seki (1958) and even pumpellyite + glaucophane is rare and occurs only in some unusual rock types (Nakajima personal communication.) Thus, even though some ambiguities remains to be solved as to the paragenetic relations in the Kanto Mountains, where the presence of jadeite + quartz (Seki, 1960) and absence of lawsonite + pumpellyite + glaucophane (Seki, 1958) are reported, the Sanbagawa metamorphic belt is generally avoid of jadeite + quartz and lawsonite + pumpellyite + glaucophane.

It follows that the schists xenoliths described here belong to a different metamorphic facies from those of the Sanbagawa metamorphics so far exposed on the surface of the earth.

Radiometric ages of the Sanbagawa schists are less than 138 m.y. (Miller et al., 1961, Banno and Miller, 1965, Yamaguchi and Yanagi, 1970, Ueda et al., 1977), while those of the schists xenoliths reported here are 208-240 m.y. Some geologists con-
sidered that the Sanbagawa metamorphism began before Triassic, probably at Permian based on the unconformity in the Kurosegawa tectonic zone (cf. Yamashita, 1957), but recently Sato et al. (1977) and Matsuda (1978) found middle to upper Triassic Conodonts from the weakly metamorphosed Chichibu formations that suffered the Sanbagawa metamorphism, such as the pumpellyite-actinolite zone of Kanto Mountains (Zone IIb of Toriumi, 1975) and the southern marginal belt in Shikoku (Nakajima et al., 1977), respectively. It has become clear that the Sanbagawa metamorphism began after middle Triassic at least in some places. From the geochronological evidences we consider that the schists xenoliths in this district are not of the Sanbagawa metamorphism but of another older one.

The Kurosegawa tectonic zone is a fault zone accompanying high-grade metamorphic rocks such as gneiss and amphibolite, acidic plutonic rocks, the supracrustal rocks of Silurian to Devonian, all of which are exotic to the surrounding Chichibu System (Ichikawa et al., 1956), but the abundance of serpentinite is another important feature of this zone. We may add the high-pressure schists xenoliths described here as an additional member of the Kurosegawa zone.

As a member of the Kurosegawa tectonic zone, the schists xenoliths have significantly younger radiometric ages than the other constituents, which are, so far as radiometric dates are measured, always about 400 m.y. old. Chronological relations of the schists xenoliths to the other constituent members are not understood.
It may be related to a 240 m.y. event reported by Nohda (1973), as the age of rejuvenation of K-Ar age of K-feldspar in 400 m.y. gneiss, but the possibility that they were formed by different geological events cannot be disproved now.

In any case, the presence of typical jadeite-glaucophane schists xenoliths in the Kurosegawa zone, situated on the Pacific ocean side of the Sanbagawa belt requires further consideration on the development of the Japanese Islands in southwest Japan. Our trial view on this problem will be discussed elsewhere in near future.

ACKNOWLEDGEMENTS

We wish to express our sincere thanks to Mr. H. Haramura for chemical analysis of jadeite, and to Mr. T. Nakajima for collaboration in the study of metamorphic rocks of this area and for oral communications of his experience in the Kanto Mountains. Messrs. I. Hiraiwa and S. Yogo of Nagoya University made some of thin sections examined, to whom we are grateful. One of us (S.M.) is indebted to Prof. K. Ishioka, Dr. K. Suwa and Dr. Y. Tsuzuki of the same University for their continuous encouragement.

REFERENCES


English abstract.


四方高市付近の黒瀬川構造帯に産する 208-240 m.y. の放射性年代を示すヒスイ輝石-重晶石片岩

丸山 茂徳・航田 良夫・坂野 昇平

四方中央部高知市北方の黒瀬川構造帯からヒスイ輝石-重晶石帯相系に属する変成岩が発見された。これらは変成作用中にゼノリスとして産する。変成岩の産出は緑色片岩-角閃岩-斜状凝晶-斜状凝晶-ハイアロクラスタイト・チャートである。組織の観察から3回の変成作用が識別される。それらは初めに低圧変相系に属する中～高変成度の変成作用、次にヒスイ輝石-重晶石帯低圧変成作用および高圧下での後変成作用である。全ての高圧変成岩が初期の低圧変成作用を受けた証ではない。高圧結晶体と平衡であったと思われる白雲母のK-Ar年代に208-240m.y.を示す。従って、これらの高圧変成岩は三波川変成作用より古い変成作用の産物である。

Ino: 伊野, Kochigatan: 川内ケ谷, Engyoji: 園行寺, Takaoka: 高岡, Yokokurayama: 横倉山