Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P01 Room:Convention Hall Time:May 25 18:15-19:30

Re-examination of phase diagram in Enstatite-Ferrosilite system at 1 atm

OHI, Shugo[1]*

[1]Kyoto University, Science

Pyroxene is one of the most important rock-forming minerals not only for its abundant occurrence but also for various paragenesis which provide information on the thermal history of pyroxene-bearing rocks. In the system Mg2Si2O6-CaMgSi2O6, there had been the controversy about the appearance and stability of the orthopyroxene (Opx) phase near 1400 C other than protopyroxene (Ppx) since the discovery by Foster and Lin (1975). In recent years, Ohi et al. (2008) observed the isosymmetric phase transition between low-temperature Opx (LT-Opx) and high-temoperature Opx (HT-Opx) at 1170 C by high-temperature X-ray powder diffraction (HT-XRD) experiments. They concluded that Opx the phase near 1400 C was HT-Opx. In Mg2Si2O6-Fe2Si2O6 system, there was no report about the stability field of HT-Opx. The purpose in present study is to clear the stability field of HT-Opx.

In present study (i) synthetic experiments with gels in Mg2Si2O6- Fe2Si2O6 system and (ii) those with Opx crystals were carryed out. (i) 28 samples were synthesized from gels with 10 kinds of compositions in Mg2Si2O6- Fe2Si2O6 system at temperatures between 1210-1450 C. (ii) Natural Opx (En86Fs14; Bamble, Norway), natural Opx (En83Fs17; Morogoro, Tanzania), natural Opx (En63Fs37; Tamagawa, Ibaragi) and synthetic Opx (En80Fs20 and En70Fs30) was kept at temperatures between 1210-1230 C to observe the transition from Opx to Cpx. Samples of experiments (i) and (ii) were synthesized in one-atmosphere gas mixing (H2-CO2) furnace. The furnace oxygen fugacity maintained near iron-wustite buffer. Recovered samples were analyzed with X-ray powder diffractometer (XRD; Rigaku Smart Lab), a scanning electron microscope (SEM; HITACHI S-3000) and energy dispersive X-ray spectrometer (EDX; HORIBA EMAX7000).

In synthetic experiments of (i), Ppx crystals were observed when En95-85Fs5-15 starting materials were kept at the temperatures 1375-1445 C. Opx phase appeared near 1400 C and En75Fs25 chemical compositions. Cpx phase appeared at temperature between 1200-1300 C. The appearances of Ppx and Opx were coincident with the phase diagram of Mg2Si2O6- Fe2Si2O6 system indicated by Huebner (1980), whereas those of Cpx were not. In synthetic experiments of (ii), the phase transition from Opx to Ppx was observed in the run with Natural Opx (En86Fs14) and those from Opx to Cpx were with natural Opx (En63Fs37) and synthetic Opx (En80Fs20 and En70Fs30) at about 1200 C. The transitions showed the stability field of Opx indicated by Huebner (1980) at about 1200 C was incorrect.

The stnthetic experiments showed Ppx or Cpx were stable at about 1200 C. Huebner (1980) indicated that there was series of Opx stabirity field at 900-1400 C because Opx was known as stable phase below 1000 C and Huebner and Turnock (1980) showed Opx was stable around 1400 C. However, Opx below 1000 C was LT-Opx and that around 1400 C was HT-Opx. Therefore, there was no reason to consider the series of Opx stabirity field at 900-1400 C.

In present study, new phasse diagram of Mg2Si2O6- Fe2Si2O6 system was proposed in consideration of stability field of below 1000 C and around 1400 C and those of Ppx and Cpx at about 1200 C.

Keywords: orthopyroxene, phase diagram, Mg2Si2O6-Fe2Si2O6 system, phase relationship

Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P02 Room:Convention Hall Time:May 25 18:15-19:30

Origin of siderite-rich rocks from the Ishikari coalfields of Central Hokkaido, Japan(III)

ASANO, Yuki[1*] ; MORIKIYO, Toshiro[2]

[1]Department of Geology, Graduate School of Science Shinsyu University, [2]Department of Geology, Faculty of Science Shinsyu University

Ikegami (1958) described mineralogical features of siderite-rich rocks in the Ishikari coalfield at first time. After that, origin of these characteristic rocks were investigated by Matsumoto and Iijima (1981). Asano et al. (2014) measured whole-rock chemical compositions and carbon-oxygen isotope ratios of sideritic rocks, which had not been reported to that time. They reached a new view as to the genesis of siderite, which is different from Matsumoto and Iijima (1981). Subsequently, Asano and Morikiyo (2015) studied Mn/Fe ratios and carbon-oxygen isotope ratios of calcite and siderite in the rocks. On the basis of the chemical data and textural observation, they conclude that crystallization of calcite occurred before the precipitation of siderite. Calcite precipitation is due to the reduction of $Fe(OH)_3$ by carbonaceous matter, which is abundant in the coaly bed.

In this poster presentation, we describe the entire process of sideritic rock formation in the Ishikari coal field.

1. The source of iron of siderite is thought to be dissolved Fe^{2+} in stream water. The water flows into the lake of meandering river area of plains. Then the water becomes exposed to the oxygen-rich atmosphere. This lead oxidation of dissolved Fe^{2+} and Mn^{2+} to $Fe(OH)_3$ and $MnO_2 \cdot nH_2O$. These solid particles of hydro-oxides were deposited at the bottom of the lake together with $FePO_4$.

2. Most of $Fe(OH)_3$ was contained in the clastic materials with a dispersed fashion. But in some cases, they accumulate at the bottom of a lake horizontally forming thin layers of iron-rich sediments. The chemical compositions of the host clastic matter is similar to the average shale.

3. With the progress of sediment burial, sediments-pore water system became anoxic. Then, $Fe(OH)_3$ deposited within the sediments were reduced to be Fe^{2+} by the reaction with carbonaceous matter, which was abundant in the sediments. Production of CO_2 by the oxidation of carbonaceous matter brought in the precipitation of calcite of lowδ^{13}C value. At the time of decreasing in Eh, $MnO_2 \cdot nH_2O$ is reduced prior to $Fe(OH)_3$ reduction. Because of this, the Mn/Fe ratio of calcite is higher than that of siderite. 4. Since the concentration of $SO_4{}^{2-}$ ion of river water is low, the sulfate reduction ceased in an early stage of diagenesis. Then the methane fermentation begins. At this stage, the siderite possessing positive, high δ^{13}C value started to precipitate forming the siderite nodules and thin beds of sideritic rocks.

- Asano, Y., Kusakabe, T., and Morikiyo, T. (2014) Formation of sideritic rocks in the Ishikari coalfield — particularly on the source and precipitation of iron. The 121st Annual Meeting of the Geological Society of Japan Abstracts R9-O-4, p.96
- Asano, Y. & Morikiyo, T. (2015) Formation processes of sideritic rocks in Central Hokkaido Ishikari coalfield (II) — For Calcite coexisting with Siderite. The Annual Meeting of the Sedimentological Society of Japan Abstracts. (Submitted to.)
- Ikegami, S (1958) Preliminary Note on the Sideritic Band (Ironstone) in the Horokabetsu Formation in the ishikari Coal Field., Mineralogical Journal, volume3, No.6, 592-596
- Matsumoto, R. and Iijima, A. (1981) Origin and diagenetic evolution of Ca-Mg-Fe carbonates in some coalfield of Japan. Sedimentology, 28, 239-259.

Keywords: carbonate concretions, behavior of the elements, Ishikari coalfield

Japan Geoscience Union Meeting 2015
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SCG58-P03 Room:Convention Hall Time:May 25 18:15-19:30

REE and Sr and Nd isotopic compositions of granitic rocks from the Hua Hin area, Thailand

YUHARA, Masaki[1]* ; KAMEI, Atsushi[2] ; NAKANO, Nobuhiko[3] ; YOSHIMOTO, Aya[3] ; KAWAKAMI, Tetsuo[4] ; KAMIKUBO, Hiroshi[5] ; OSANAI, Yashuhito[3] ; CHARUSIRI, Punya[6]

[1]Fukuoka Univ., [2]Simane Univ., [3]Kyushu Univ., [4]Kyoto Univ., [5]JOGMEC, [6]Chulalongkorn Univ.

The granitic rocks are widely distributed in the Hua Hin area, Thailand. This area is located in the Central Province (Cobbing, 2011) consists mainly of S-type granitic rocks, whose ages range from early Late Triassic to late Early Jurassic (ca. 230-180 Ma) (Sone and Metcalfe, 2008). The petrogenesis of these granitic rocks is explained by partial melting of the Sibumasu crust subducted beneath the Palaeo-Tethys accretionary complex (Sone and Metcalfe, 2008). However, characteristic of source material of granitic rocks in the Hua Hin area are poorly understood. In this paper, we report REE and Sr and Nd isotopic compositions of granitic rocks from this area.

The granitic rocks in the Hua Hin area are composed of foliated granitic rocks and non-foliated granitic rocks. The formers are the Hub Kapong Gneissic Granite, Hua Hin Gneissic Granite and Pran Buri Gneissic Granite. The Hub Kapong and Hua Hin Gneissic Granites are partly weakly mylonitized K-feldspar porphyritic biotite granite. The Hub Kapong and Hua Hin Gneissic Granites give Rb-Sr whole-rock isochron ages of 202+/-22Ma and 209+/-14Ma, respectively (Yuhara et al., 2011). Kawakami et al. (2014) reported 219+/-2Ma and 185+/-2Ma U-Pb zircon ages from the Hua Hin Gneissic Granite, and interpreted that these ages represented the timing zircon crystallization and regional metamorphism of upper amphibolite facies grade, respectively. The Pran Buri Gneissic Granite is mylonitic biotite granite. Non-foliated granitic rocks are stock bodies intruded into the Hub Kapong Gneissic Granite, and composed of biotite to two-mica granite. A body of non-foliated granitic rocks gives an Rb-Sr whole-rock isochron ages of 84+/-13Ma (Yuhara et al., 2011). These granitic rocks have peraluminous chemical composition (Yoshimoto et al., 2010).

Chondrite-normalized REE patterns of these granites are enriched in light REE (LREE) and depleted in heavy REE (HREE). These granites show Eu anomalies. Non-foliated granitic rocks show flat patterns in HREE. Initial epsilon Sr and Nd values of the Hub Kapong and Hua Hin Gneissic Granites are 270 to 340 and ?15.6 to -8.8, and 240 to 360 and ?13.5 to -9.3, respectively. Model epsilon Sr and Nd values of the Pran Buri Gneissic Granite calculated by 209Ma are 510 to 1040 and ?8.7 to -6.9. Initial epsilon Sr and Nd values of non-foliated granitic rocks are different every bodies, and are 970 and -11.2, 440 and -10.6, 60 and -9.8, respectively.

Keywords: REE composition, Sr and Nd isotopic compositions, granitic rocks, Hua Hin, Thailand

Japan Geoscience Union Meeting 2015
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SCG58-P04 Room:Convention Hall Time:May 25 18:15-19:30

Rare elements concentration related to behavior of the H2O, F, B and P, in Nagatare pegmatite, Fukuoka Prefecture

SHIROSE, Yohei[1]* ; ITO, Shin[1] ; UEHARA, Seiichiro[1]

[1]Dept. Earth & Planet. Sci., Fac. Sci., Kyushu University

Nagatare pegmatite, located at the western area of Fukuoka City, Fukuoka Prefecture, is considered that it derived from the Sawara granite, which intruded into the Itoshima granodiorite (Karakida et al., 1994). The pegmatite also intruded into the Sangun metamorphic rocks. The most characteristic properties of Nagatare pegmatite is the enrichment of rare elements such as Li, Cs and Ta, resulting as the occurrence of various rare element minerals. We have been investigating about each mineral in detail (e.g., Shirose and Uehara, 2014). There are differences for each dyke on constituent minerals and internal textures. Li enriched pegmatite is only one dyke located in Mt. Nagatare, and many of the dykes are simple pegmatites, bearing a common granite composition. In this study, the variation of constituent minerals, and chemical compositions of accessory minerals were studied, and the forming process of Li pegmatite were discussed with a focus on H_2O, F, B and P as flux components in granite melts.

Li mineral deficient pegmatites often occurred with aplites, with a dyke-shape body, 5-20 m in width and elongating along N20^{o}W, which is concordant with lamination structures of Sawara granite. The pegmatites were mainly consisted of quartz, K-feldspar, albite and muscovite, showing simple pegmatite compositions close to the chemical composition of granite. However, some pegmatites contained rare elements minerals such as beryl and columbite, without Li minerals, indicating the concentrations of rare elements including Be, Nb and Ta. In addition, they contained garnet and gahnite, indicating the peraluminous compositions. A pegmatite dyke intruding metamorphic rocks had tourmaline as borosilicate mineral, in addition to garnet and beryl. In Li pegmatite, in addition to the minerals above, triplite and montebrasite-amblygonite occurred as fluorine phosphates, and abundant lepidolite existed as F enriched mica.

As for chemical compositions of tourmaline, Fe and Mg were dominant without F contents in the tourmaline from the pegmatite intruding metamorphic rocks, while the tourmaline from Li pegmatite show fractionated trends from Fe-Li to Li-Al dominant chemical compositions with F enrichment. F contents of montebrasite-amblygonite show a high F concentration at the central part of Li pegmatite, 1.4-2.0 wt% F contents, using the partition coefficient to melt estimated by London et al. (2001). Columbite group minerals [(Fe, Mn)(Nb, Ta)$_2$O$_6$] were common accessary minerals in the Nagatare pegmatite. The chemical trends are Mn/(Mn+Fe) = 0.3-0.6 with Nb enrichment in the simple pegmatites, and Mn/(Mn+Fe) = 0.4-1.0 with Nb to Ta enrichment on Mn endmember. Their chemical trends coincide with that of columbite group minerals, suggested by Wise et al. (2012), corresponding to F contents of pegmatite.

In Li pegmatite from Nagatare, primary Li-tourmaline and K-feldspar had undergone alteration to clay minerals such as muscovite and cookeite. Montebrasite-amblygonite also altered into various secondary phosphates and muscovite. These reactions are hydrothermal replacement by H_2O enriched residual fluids in the late stages of pegmatite forming process, and it is suggested as a characteristic reaction in the H_2O enriched Li pegmatite. On assuming the latest elemental behavior, it is required to reveal these alteration processes and behaviors of B and Li released by tourmaline breakdown.

It is assumed that chemical and zonal developments of pegmatite are highly controlled by flux components in granite melts such as H_2O, F, B and P. As for Nagatare Li pegmatite, it is characterized by enrichment of F contents. In many cases, these elements are derived from peraluminous granite, considered to melt matasedimentary rocks, and we need to focus on properties of the surrounding granite, in addition to P-T conditions of formations.

Keywords: Li pegmatite, Nagatare, rare elements, tourmaline, fluorine, flux

Japan Geoscience Union Meeting 2015
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SCG58-P05 Room:Convention Hall Time:May 25 18:15-19:30

Rare earth element compositions of Neogene plutonic rocks, North Fossa Magna, Japan

KAWANO, Yoshinobu[1]*

[1]Department of Environment Systems, Faculty of Geo-environmental Science, Rissho University

Neogene plutonic rocks are distributed in North Fossa Magna (NFM), and consist of mainly quartz diorite. Chino, Shimosuwa, Wada, Matsumoto, Utsukushigahara and Yori bodies, Ueda, Horikiri and Myoutoku-Yonago bodies and Makihatayama, Tanigawadake and Akayu bodies expose in Utsukushigahara-Kirigamine (UK), Suzaka-Ueda (SU) and Makihata-Tanigawa (MT) areas, respectively. It is considered that these plutonic rocks in NFM are derived from upper mantle, since they are characterized by low K_2O/Na_2O ratio and Tin content (Ishihara et al., 1976).

In chondrite normalized REE patterns, the Chino and Shimosuwa bodies in UK area have weak negative Eu anomalies, whereas others in same area show no anomalies. The Matsumoto, Wada and Chino bodies are characterized by LREE enrichment. All bodies in UK area have relatively constant patterns of HREE, but the Wada body has low HREE contents. The Myoutoku-Yonago body in SU area has weak negative Eu anomaly, and is characterized by LREE enrichment. All bodies in SU area have also relatively constant patterns of HREE. The Makihatayama and Tanigawadake bodies in MT area have negative Eu anomalies, and show right downward sloping patterns of LREE and constant patterns of HREE. La/Sm_N and La/Yb_N ratios of all bodies in three areas increase with decreasing SiO_2 contents. It suggested that LREE concentrated to residual magma and change of HREE was small. Eu/Eu^* ratio of those slightly decreases with decreasing SiO_2 contents, and the rocks in UK area have higher ratios of Eu/Eu^* than those of SU and MT areas.

The plutonic rocks distributed in respective areas have peculiar features of REE, suggesting that they have different origin and magma process.

Keywords: North Fossa Magna, Neogene, plutonic rock, rare earth element

SCG58-P06 Room:Convention Hall Time:May 25 18:15-19:30

Origin of the Miocene mafic volcanic rocks distributed in Utsunomiya and Kanuma, central Japan

SHIMIZU, Ryuichi[1*] ; KAWANO, Yoshinobu[2]

[1]Graduate School of Geo-environmental Science, Rissho University, [2]Faculty of Geo-environmental Science, Rissho University

Two types of volcanic rocks were reported from Miocene formation distributed in Utsunomiya area, central Japan. Andesite and rhyolite are intercalated with the Kazamiyamada Formation, in the lower, and the Oya Formation, in the upper, respectively. The Kazamiyamada formation derives subaerial volcanism, and in contrasts the Oya formation formed by submarine volcanic eruption. K-Ar whole rock ages of the Kazamiyamada andesite and the Oya rhyolite are reported as 14.8-16.6 Ma and 14.2 Ma, respectively (Yoshikawa, 1998; Yoshikawa et al., 2001). These ages of igneous activity correspond to the opening event of Japan Sea. The authors reported chemical characteristics of volcanic rocks occurred in the Utsunomiya area (Shimizu and Kawano, 2013).

On the other hand, Miocene Primitive Basalt, Andesite and Dasite distributed are Kanuma area from Hinata formation, to the west side of the Utsunomiya area.

This study compared the Kazamiyamada andesites with the Hinata mafic volcanic rocks.

Keywords: Miocene volcanism, Utsunomiya area, Kanuma area, Sr and Nd isotope ratios

SCG58-P07 Room:Convention Hall Time:May 25 18:15-19:30

Establishment of new index of sediment input into granitic magma using trace element composition in zircon

SUZUKI, Kazue[1*] ; SAWAKI, Yusuke[1] ; HATTORI, Kentaro[2] ; HIRATA, Takafumi[2] ; ARAI, Hiroyoshi[3] ; OMORI, Soichi[4] ; MARUYAMA, Shigenori[5]

[1]Department of Earth and Planetary Sciences, Tokyo Institute of Technology, [2]Division of Earth and Planetary Sciences, Kyoto University, [3]Waseda University Honjo Senior High School, [4]The Open University of Japan, [5]Earth-Life Science Institute, Tokyo Institute of Technology

Understanding of formation process of granitic magma is one of the important issues to unveil evolution of Earth history. Evaluating amounts of sediment incorporation into granitic rocks is necessary to comprehend formation process of granite. Sedimentary components in granite have been estimated from whole rock geochemistry such as alumina saturation index and radiogenic Sr isotopic ratio. However, these whole-rock values do not necessarily reflect original magma composition, because chemical composition of the magma changes with magma evolution process (e.g. Griffin et al., 2002; Belousova et al., 2006).

Trace element compositions in zircon could be a useful tracer for evaluating amounts of sediment contamination into granitic magma (e.g. Belousova et al., 2006). In order to establish a new indicator for estimating quantity of sedimentary components in granite, we focus on modern granitic belts where tectonic settings are well constrained. We conducted in-situ analyses of trace element compositions in 188 zircon grains from the Tanzawa Tonalite (4-9 Ma; Tani et al., 2010) and 210 zircon grains from the Taitao Granitoid (4-5 Ma; Anma et al., 2009) with LA-ICP-MS. The Tanzawa Tonalite is the best target for this study, because it emplaced at middle crust of immature oceanic island arc where influence of sedimentary contamination is extremely low. On the other hand, the Taitao Granitoids contain small amount of sedimentary components because the granitoid were intruded into Jurassic accretionary complex.

Zircons from the Tanzawa Tonalite and the Taitao Granitoid show enrichment of HREE, negative Eu anomaly and positive Ce anomaly, which are typical characteristics of those in most granites. Trace element compositions in zircons from the Taitao Granitoids show lower Yb/Sm ratios than those from the Tanzawa Tonalite. As combined with previous trace element data in zircons from oceanic plagiogranite, S-type granite and I-type granite, a clear correlation can be observed between ln(Ce/Ce$*$) and ln(Yb/Sm). Higher Ce/Ce$*$and Yb/Sm ratios in the Tanzawa Tonalite are consistent with little sedimentary component deduced from its tectonic setting. In addition, results from principal component analysis using these trace element data show strong correlations among ln(La/Sm), ln(Pr/Sm) and ln(Nd/Sm) values in zircons. Cross-plots of these values exhibit that trace element compositions in zircons from the Tanzawa Tonalite and oceanic plagiogranite are plotted on different fields from those from S-type granites. High La/Sm, Pr/Sm and Nd/Sm ratios in zircons from the S-type granite probably reflect high LREE concentration in sediments. Therefore, these trace element compositions can be useful to evaluate influence of sedimentary components into granite. The results in this study demonstrate that trace element composition in zircons has a possibility to provide more detail information for protolith of granite.

Keywords: Zircon, Trace element composition, LA-ICP-MS, Tanzawa Tonalite, Taitao Granite, Sediment contamination

Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P08 Room:Convention Hall Time:May 25 18:15-19:30

Serpentinite and Rodingite from Mikabu belt, Central Japan

ENJU, Satomi[1]* ; UEHARA, Seiichiro[1]

[1]Department of Earth and Planetary Sciences, Faculty of Sciences, Kyushu University

Introduction

Serpentinites are valuable evidence of hydrothermal activity in deep earth. They are often made by hydrothermal alteration of peridotite, the main component of the mantle, at relatively low temperatures. They form in specific conditions, such as subduction zone and mid-atlantic ridges. They capture and release various elements during formation, playing an important role in the geochemical cycles and biological activity (Fruh-Green, 2004).

Rodingites are greatly affected by fluid of serpentinization. Rodingites are Ca-rich, Si-poor rocks often seen at serpentinite outcrops, composed by diopside clinochlore and various Ca-Al silicates. It is thought to form by hydrothermal alteration by the fluid, who experienced serpentinization (e.g. Coleman, 1967; O' Hanley et al., 1992). The mineral assemblage seems to be affected by the composition of the fluid, showing various combinations within the same locality, though the system is not totally understood (Kobayashi and Shoji, 1988; Li et al., 2007).

Methods

In this study the formation process of serpentinite and rodingite was investigated by the observation of the samples from ultramafic body in the Mikabu green rocks, central Japan. The samples were collected from Nakauri and Yoshikawa in Aichi prefecture, and Shiokawa peridotite body in Nagano prefecture (Makimoto, 1978; Uesugi and Arai, 1999). In this presentation, the samples from Shiokawa peridotite were mainly handled. The constituent minerals were determined by X-ray diffraction pattern, and texture observation and quantitative chemical analysis was carried out by scanning electron microscope.

Results and Discussion

The main contents were dunite and serpentine with various degree of serpentinization. The serpentinized part often included clinopyroxene, showing that wehrlite altered to serpentinite while dunite remained fresh. Rodingite was seen as dikes of few meters or of few centimeters in size, accompanied by dunite or serpentinite. The consistent minerals were diopside, clinochlore, vesuvianite, and andradite.

In serpentinite, an Al-rich area of serpentine, which seem to take shape of the primary mineral, was often seen. In one sample, pumpellyite-(Al) and grossular was seen in the center of this texture, formed by the saussurization of plagioclase. A needle like clinopyroxene, Ca-poor than the primary clinopyroxene, was seen around this structure, and the following formation sequence is proposed. First, the plagioclase undergoes saussuritization and turns into fine grained minerals such as pumpellyite-(Al), grossular. Then those minerals become Al-rich serpentine and releases Ca, forming clinopyroxene of needle like shape, replacing the surrounding olivine and evolving around the primary clinopyroxene with sharp contacts. Needle like clinopyroxenes were seen where the degree of serpentinization is high, indicating that this reaction caused by plagioclase accelerates serpentinization.

In rodingite, a primary clinopyroxene, showing the same features as those in serpentinite, was replaced by vesuvianite, andradite, clinopyroxene. The estimated order of formation is diopside, vesuvianite, andradite, Fe-rich andradite, and clinochlore were present in all stages. The mineral of the host rock is thought to be clinopyroxene and saussurized plagioclase. Therefore, the rodingite veins should have formed in the gabbrotic part of the peridotite, which means the source and receiver of rodingitization coexists inside a single rock type.

As mentioned above, rodingite coexists with dunite in this locality, which is quite unique, since most reported rodingites accompanies completely serpentinized serpentinite. Rodingite of this occurrence lack the soure of the serpentinized fluid, so the transportation is essential for formation. Since the rodingites show the same features irrelevant to the degree of serpentinization of the surrounding rock, the same fluid was thought to be supplied from the surrounding serpentinites.

Keywords: serpentinite, rodingite, dunite, needle like clinopyroxene, serpentine, clinochlore

SCG58-P09 Room:Convention Hall Time:May 25 18:15-19:30

U-Pb zircon dating of the Late Cretaceous volcanic rocks from the Ikuno and Mitsuishi mines area, southwest Japan

SATO, Daisuke[1]*

[1]GSJ, AIST

Numerous hydrothermal ore deposits occured in Late Cretaceous to Paleogene igneous rocks are distributed in the Inner Zone of southwest Japan. The Ikuno mine in north-central Hyogo Prefecture is hydrothermal polymetallic ore deposit. This mine was produced by replacement of the Late Cretaceous dacite to rhyolite tuff and lapilli tuff of the medium to lower Ikuno Formation and dikes by high temperature fluids probably generated around granitic rocks. The Mitsuishi mine in southeastern Okayama Prefecture is hydrothermal pyrophyllite and sericite deposit. This mine was produced by replacement of the Late Cretaceous rhyolite welded tuff and lapilli tuff of the lower Wake Formation by high temperature fluids.

U-Pb zircon dating using LA-ICP-MS was carried out for 2 pyroclastic flow deposit samples from the Late Cretaceous volcanic rocks in the Ikuno and Mitsuishi mine area, southwest Japan. The Ikuno and Mitsuishi mines are determined to be 78.9±0.9 Ma and 82.4±0.6 Ma, respectively.

Keywords: U-Pb age, Ikuno mine, polymetallic vein, Mitsuishi mine, pyrophyllite and sericite clay deposit, Late Cretaceous

SCG58-P10 Room:Convention Hall Time:May 25 18:15-19:30

Geochronology of detrital zircon from the Highland Complex, Sri Lanka: Implications for Gondwana reconstruction

TAKAMURA, Yusuke[1*] ; TSUNOGAE, Toshiaki[1] ; SANTOSH, M[2] ; MALAVIARACHCHI, Sanjeewa p.k.[3] ; TSUTSUMI, Yukiyasu[4]

[1]Faculty of Life and Environmental Sciences (Earth Evolution Sciences), University of Tsukuba, [2]School of Earth Science and Resources, China University of Geeosciences Beijing, [3]Department of Geology, Faculty of Science, University of Peradeniya, [4]Department of Geology and Paleontology, National Museum of Nature and Science

Sri Lanka is regarded as one of the important regions to unravel the process of Gondwana amalgamation because it was located in the center of the collisional orogeny formed during Late Neoproterozoic. The Highland Complex, exposed at the central part of Sri Lanka, is metamorphosed to granulite-facies conditions (e.g., Faulhaber and Raith, 1991; Hiroi et al., 1994; Raase and Schenk, 1994). Ultrahigh-temperature metamorphic conditions are also reported from some localities in the Highland Complex (e.g., Osanai et al., 2006; Sajeev and Osanai, 2004; Sajeev et al., 2007). The Highland Complex is dominantly composed of metasediments that include detrital zircons, and their age distributions can be used to infer the correlation between some depositional basins and their provenance (e.g., Collins et al., 2007; Kuznetsov et al., 2014). Although some authors (Holzl et al., 1994; Kroner et al., 1987) obtained Archean to Paleoproterozoic detrital zircon ages from metasediments in the Highland Complex, they did not discuss about the detail correlation of the Highland Complex with other Gondwana fragments. This study focuses on geochronology of detrital zircons in metasediments from the Highland Complex in order to unravel the regional geographical correlation of Sri Lanka within Gondwana supercontinent.

We collected four samples of quartzite and pelitic gneiss from the Highland Complex, separated detrital zircons from them, and analyzed U-Pb ratios using LA-ICP-MS. The detrital zircon ages are distributed from ca. 3500 Ma to ca. 1700 Ma with strong peaks at around 2700 Ma, 2500 Ma, and 2000 Ma. These age distributions of detrital zircons are consistent with those from the Palghat-Cauvery Suture Zone (e.g., Raith et al., 2010; Sato et al., 2011), but different from those of the Trivandrum Block and the Achancovil Shear Zone (Collins et al., 2007), South India, because they have Mesoproterozoic detrital age not found in the Highland Complex zircons. Thus, the Highland Complex could be correlated with the Palghat-Cauvery Suture Zone as a sedimentary basin rather than the Trivandrum Block or the Achancovil Shear Zone in southern India.

The precursor of the Wanni Complex could be a possible source of the Highland Complex before it was reworked based on available Hf crustal model ages of zircon (Santosh et al., 2014). The Dharwar Craton (ca. 3400-2500 Ma; Chadwik et al., 2000; Collins et al., 2003), the Salem Block (ca. 2750, 2600, 2500 Ma; e.g., Collins et al., 2014; Ghosh et al., 2004; Saitoh et al., 2011), and northern Madurai Block (ca. 2500 Ma; Collins et al., 2014, Plavsa et al., 2012, Teale et al., 2011) are also possible provenances of sediments of the Highland Complex. In contrast, crustal blocks in East Africa are difficult to be source regions of the Highland Complex because they are composed of rock units younger than Mesoproterozoic (Kibaran belt; ~1400 Ma; Kokonyangi et al., 2004).

Keywords: Gondwana, Sri Lanka, The Highland Complex, Detrital Zircon, LA-ICP-MS, Suture Zone

Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P11 Room:Convention Hall Time:May 25 18:15-19:30

Metamorphic P-T evolution of garnet-clinopyroxene rocks from the Gondwana collisional orogen in southern India

YANO, Minami[1*] ; TSUNOGAE, Toshiaki[2] ; IINUMA, Minako[2] ; SANTOSH, M[3]

[1]Univ. Tsukuba, [2]Univ. Tsukuba, [3]China Univ. Geosci.

The East African - Antarctic Orogenic Belt, which includes Madagascar - Southern India - Sri Lanka - East Antarctica regions, is regarded to have been formed by complex subduction-accretion-collision tectonic events related to the amalgamation of Gondwana Supercontinent during Neoproterozoic. The Palghat-Cauvery Suture Zone in southern India is known as a major suture zone that formed during the closure of Mozambique Ocean at ca. 530-550 Ma. The dominant lithologies of the suture zone are felsic to intermediate orthogneiss, metasediments, and mafic-ultramafic suites. Particularly, the occurrence of mafic-ultramafic suites (ophiolite or layered intrusion) is a unique character of the suture zone compared to surrounding granulite blocks and cratons. Here, we report new petrological data of metagabbroic garnet-clinopyroxene rocks from southern India and discuss its petrological implications. Mineral assemblages of the rocks are garnet + clinopyroxene + ilmenite + plagioclase + quartz with retrograde hornblende. Similar rocks and textures have been reported from the Palghat-Cauvery Suture Zone in South India (Nishimiya et al., 2008; Saitoh et al., 2011), Highland Complex in Sri Lanka (Osanai et al., 2006; Takamura et al., 2014), and Lutzow-Holm Complex in East Antarctica (Saitoh et al., 2012). However, temperature and pressure conditions inferred for the metagabbro based on geothermobarometry are 680-710C and ~9 kbar, which is significantly lower than the results of previous studies (>12 kbar, >800C). The metagabbro could be an exotic block with discrete P-T evolution trapped during the formation of the Palghat-Cauvery Suture Zone.

Keywords: granulite, P-T path, Gondwana

Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P12 Room:Convention Hall Time:May 25 18:15-19:30

Proposal of a portable particle size analyzer by a spatial filter velocimetry for a field work of geoscience.

SATO, Fumiaki[1]* ; SASAKURA, Daisuke[1]

[1]Malvern instruments A division of Spectris Co., Ltd.

1.Introduction

The existing popular approach at geoscience to measure particle size analysis is a sieving technique. The sieving has advantages such as portability, robustness and easy to understand. The drawback of the sieving are low resolution to particle size, require of a long period of time to measure and bulky equipment. Therefore, real time analysis, compact equipment, wide range and high resolution methods may be preferable at the recently geoscience research. One of approach to respond to this issue is a inline particle analysis by spatial filter velocimetry (SFV) method. SFV method is one of application of light blocking (obscuration) methodology, and it has capability to wide range particle size measurement such as in micron to centimeter with a several decade second. This approach has capability to investigate sample in nature, such as a cray, sand and a sea soil on anywhere. This report will propose to capability and application to particle size analysis for geoscience by SFV method.

2.System

A Parsum (Malvern Instruments) was proposed to this application. The advantages of this device are compact, lightweight , battery drive is possible and a calibration free. The specification of particle measurement range is 50 to 6,000um which is sufficient to generally geoscience application.

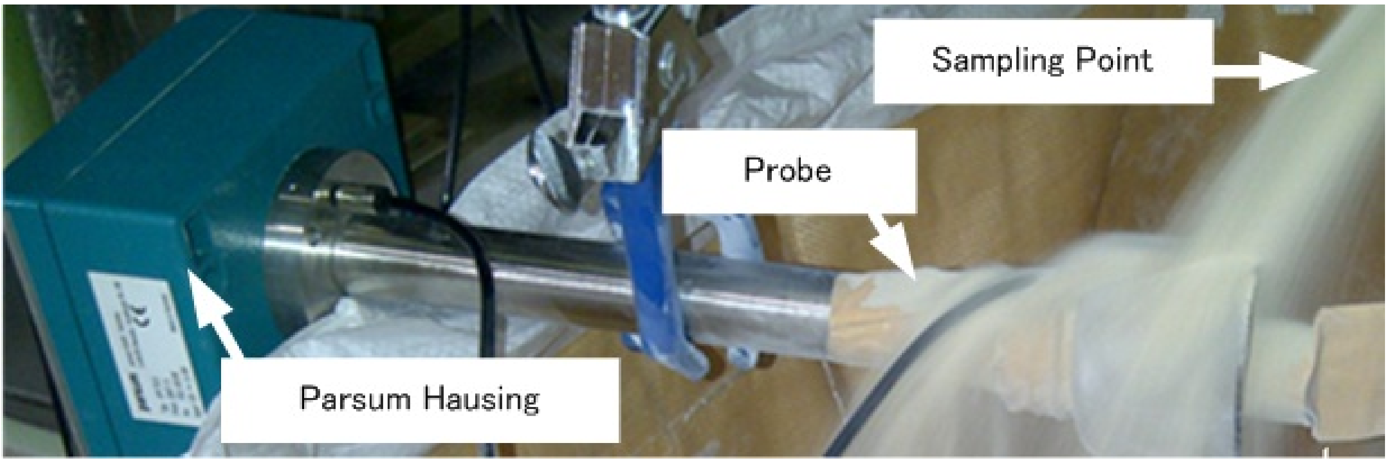
3.Feasibility study

It was shown that schematic picture at feasibility study in Fig.1. This application is real time monitoring powder transportation in the field of certain industry. It was comparable study between the sieving with intermittently sampling and SFV method with real time monitoring. As result of volume fraction in 150um were 64.2% by SFV method and 57.4% by sieving . This meaning is similar result in both methods.

4.Conclusion

This report will propose other applications for field work in this study.

Keywords: Real time inline particle analysis, Portable particle size analyzer, Sieving technique, A field work of geoscience., A spatial filter velocimetry



Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SCG58-P13 Room:Convention Hall Time:May 25 18:15-19:30

In-situ observation of formation process of carbon-rich minerals in several sites of Yamaguchi,Japan.

MIURA, Yasunori[1]*

[1]Yamaguchi, Visiting Univ.(In & Out)

1. Characteristics of carbon minerals: Carbon-bearing minerals are significant minerals to show the detailed formation process. Dynamic samples might elucidate new information of micro- to macro-carbon minerals, which are main purposes of the present paper [1-4].

2. Carbon-rich minerals from Yamaguchi Prefecture: Present carbon-bearing samples are used from three sites (Yamaguchi) and one site (Shimane) to compare dynamic formation processes[1-4].

3. Microscopic observation of carbon-containing minerals: Microscopic carbon-bearing minerals are obtained at the following six location-samples as follows [2-4].

1) Point A: Historical sample-site of basalt with phlogopite and feldspar contains microscopic carbon-bearing grains quenched as flake texture found in this study.
2) Points B: Basalt with phlogopite and feldspars shows more detailed grains and texture with tube-shaped texture with progressive change of carbon-contents. The present observation is new result to be found as carbon-separated concentrations during fluid-solid reactions shown as flake quenched texture.
3) Points C: Basalt phlogopite mica and feldspar shows carbon-bearing materials with quenched flake texture and tube-like textures.
4) Points D: Basalt with phlogopite minerals contains carbon-bearing grains with flake and tube-like textures.
5) Point E: Basalts with feldspar minerals (without any phlogopite) shows carbon-bearing grains on feldspar minerals.
6) Points F: Carbon-rich grains can be found separately on feldspar surface (without phlogopite).

4. Identification of carbon minerals: Carbon-rich grains from point B have been investigated by X-ray diffraction and Raman Spectroscopy, where the characteristics of high pressure-type carbon minerals(diamond-like) have been obtained in this study.

5. Formation of high-pressured carbon minerals: Dynamic process and tube-like texture indicate carbon-separation from carbon-bearing minerals during shock wave processes of volcano and impact process.

6. Summary: Carbon-rich grains of high-pressure form (microscopic diamond) are obtained on the Yamaguchi samples (grain B) compared with other samples in Japan, where carbon-separation and concentration can be developed along solidified tube-like and fluid-like process with quenching found in the study.

References: [1] Miura Y. (2007): Front. Mineral Sci. (Cambridge Univ.), 223. [2] Miura Y. (2008): Am. Geo. Union, pp.1. EOS Trans, AGU, 89 (53), MR33-B1861. [3] Miura Y. (2012-2014): Japan Journal of Geological Society (Osaka, Tohoku and Kagoshima Universities), pp.1. [4] Miura Y. (2014): Inter. Mineral. Assoc. 2014 (Johannesburg, SA), 689.

Keywords: High-pressure carbon, Basalt, In-situ observation, Phologopite, Fluid solidified, Tube-like texture