

SRD043-P01

会場:コンベンションホール

時間:5月22日 10:30-13:00

## 拓洋第5海山に分布するマンガンクラストの地球化学的特徴およびレアメタル資源ポテンシャル評価

### Major and trace elements geochemistry of Co-rich ferromanganese crust from the #5 Takuyo Seamount, northwestern Pacific

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Large amount of hydrogenetic cobalt-rich ferromanganese (Fe-Mn) crusts are known to occur on the surface of seamounts or ocean plateaus in the Pacific Ocean. The Fe-Mn crust is one of the most promising seafloor mineral resources enriched in not only Cu, Co, and Ni but also REE and PGE. Here we report the geochemical features of the Fe-Mn crusts collected from the #5 Takuyo Seamount, which is located 120 km west from the Minami-torishima Island, northwestern Pacific.

The amounts of trace elements in the crusts are controlled by the MnO<sub>2</sub>(or Fe<sub>2</sub>O<sub>3</sub>) content: Those of Ni, and Cu are roughly proportional to the MnO<sub>2</sub> contents, while REE, especially HREE, show strong positive correlation with the Fe<sub>2</sub>O<sub>3</sub> content. The Mn/Fe ratios decrease toward the surface of the crusts in all samples taken at various water depths between 965m and 2987m. The Fe/Mn ratios of crust samples from the surface part within 3 mm tend to be higher along with the increase of water depths, which is similar to the vertical profile of dissolved oxygen amount in the Pacific Ocean. The crusts are characterized by high total REE contents (La-Lu) varying from 1267 to 2168 ppm (average 1660 ppm). PAAS-normalized REE patterns show flat patterns with conspicuous positive Ce anomalies. We believe that the Fe-Mn crusts are promising alternative as the source of HREE because of the high REE contents and the large ore reserve.

キーワード: マンガンクラスト, 微量元素, 拓洋第5海山, レアメタル・レアアース, 資源ポテンシャル評価

Keywords: ferromanganese crust, minor elements, #5 Takuyo Seamount, REE, resource evaluation

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## 宮城県宮崎鉱山の鉱化作用 特に梵天石膏鉱床について

## Mineralization of Miyazaki Ore Deposits, Miyagi Prefecture, Japan -Especially about Bonten Gypsum Deposit-

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宮崎鉱山は宮城県北西部の宮崎町に位置し、いくつかの石膏鉱床とマンガン鉱床、鉛・亜鉛鉱床が存在する。このうち梵天石膏鉱床は初期中新世の流紋岩質凝灰岩中に胚胎している堆積鉱床であるとされる。付近の凝灰岩は7~10°南方に傾斜し、安山岩の円礫を含む凝灰岩が、鉱床の上位を占めている(安斎, 1957)。鉱床の中心は著しい粘土化変質を被っており、その中に15cmに及ぶ繊維石膏が産出する。本研究では初期中新世の梵天石膏鉱床、梵天マンガン鉱床、後期中新世の湯の倉鉱床を対象とした。

本研究では各鉱床および鉱床周辺の露頭よりサンプルを採取し、X線回折法(XRD)、流体包有物の加熱冷却実験、EPMAを用いた閃亜鉛鉱の定量分析を行い生成環境の解明を目的とした。

梵天石膏鉱床の粘土中には石英、黄鉄鉱、閃亜鉛鉱、粘土鉱物としてセリサイト、ハロイサイトが検出される。鉱床近傍の凝灰岩質母岩からは黄鉄鉱、アナルサイム、モルデナイト、スメクタイトが認められるが、鉱床から離れるにつれてあまり検出されなくなる。また、石膏中の流体包有物の加熱冷却実験より、均質化温度は50-60℃、塩濃度は4.9-3.2 wt%という値を得た。周辺の地質状況から判断して圧力補正を加えてもおよそ70℃以下の温泉作用によって生じたものと考えられる。このことは硬石膏が全く産しないことと調和的である(例えば木下, 1924)。Caの起源については温泉作用によるスメクタイト化の過程で周囲の地層の岩石から溶出したと考えられ、Sについては本鉱床が海底堆積中の沈殿鉱床であれば海水に由来すると考えられ、堆積後の二次変質により生じたものであれば温泉熱水(下位層中の黄鉄鉱等の溶出など)に由来する可能性がある。

一方、梵天石膏鉱床のやや上位の魚取沼層には梵天マンガン鉱床が胚胎しこのマンガン鉱床からはパイロルーサイト、ヘマタイトといった酸化的環境で生成する鉱物が検出された。また、さらに上位の永志田層に胚胎する湯の倉鉱床は鉛・亜鉛鉱床で、方鉛鉱、閃亜鉛鉱、黄鉄鉱、黄銅鉱、重晶石が産する。湯の倉鉱床の石英、重晶石、閃亜鉛鉱の流体包有物についての均質化温度を求めたところ、120-200℃という温度が得られた。鉱床以外でも粘土化変質や岩石中に黄鉄鉱が含まれる露頭が数か所存在し、宮崎地域は広域的にまた、異なる性質の熱水(温泉)作用を幾度も被っていたことが示唆される。

SRD043-P03

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## 豊羽鉱床における脈石石英の酸素同位体比

## Oxygen isotopic variation of vein quartz at the Toyoha deposit: a reconnaissance study

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The Toyoha deposit, an epithermal polymetallic vein-type deposit, was formed by two-stages mineralization. The veins in the northwestern part of the deposit were formed early mineralization (early-stage veins), while southeastern veins were formed by late mineralization (late-stage veins).

The oxygen isotope ratios of vein quartz were obtained for major veins. Delta <sup>18</sup>O values of quartz from early-stage veins (Rebun, Rishiri, 3rd Chikugo, Bizen and Tajima veins) are +2.8 to +5.5 per mil, and those of late-stage veins (Izumo, Sorachi, Iwami, Shinano veins) are +3.3 to +8.8 per mil. The delta values of late-stage veins are higher than those of early-stage veins. Calculated delta <sup>18</sup>O values of ore-forming fluid responsible for the veins are -9.3 to -4.2 per mil for early-stage veins, and -7.2 to +1.6 per mil for late-stage veins. These values are between local meteoric water (-11 per mil) and primary magmatic fluid (+5.5 to +9.5 per mil). The variation of delta values of ore-forming fluid can be explained by the difference of mixing ratio of meteoric water and magmatic fluid.

Previous mineralogical and geochemical studies have revealed that ore-forming conditions for early-stage and late-stage veins were distinctive. Early-stage veins were formed under relatively high oxygen fugacity, and ore-forming fluid was supplied by magnetite-series magma. Late-stage veins were formed under reduced condition, and have polymetallic nature. Difference of ore-forming conditions was explained by the model, where magnetite-series magma responsible for early-stage veins assimilated sedimentary rock then changed to reduced nature and supplied ore-forming fluid of late-stage veins (Ohta, 1995). If assimilation of sedimentary rock occurred, delta <sup>18</sup>O values of bulk rock would shift to heavier. Then oxygen isotopic data of this study supports the model proposed by Ohta (1995).

キーワード: 酸素同位体, 豊羽鉱床, 鉱液, 石英

Keywords: oxygen isotope, Toyoha deposit, ore-forming fluid, quartz

SRD043-P04

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## カムチャツカ弧, アバチャ火山産かんらん岩捕獲岩中の白金族元素に富むクレイ PGE-rich clays in a mantle peridotite xenolith from Avacha volcano, the southern Kam- chatka arc

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Platinum-group elements (PGE) have strongly refractory features within the mantle peridotite/melt system, and favor sulfides or metals (such as the earth's core). In addition, these PGE are not mobile during weathering and/or low temperature alteration processes. We found unusually high-Ni, Fe clays in a highly metasomatized mantle peridotite xenolith (sample #159) from Avacha volcano, the southern Kamchatka arc. The sample #159 contains Ni-rich spots, composed of mantle minerals with high-Ni contents: NiO contents of olivine, orthopyroxene, and chromian spinel is up to 5.3 wt%, 1.1 wt% and 1.1 wt%, respectively, there. The high-Ni, Fe clays are located at the center of the Ni-rich spot, and the Ni content of minerals decreases from the center outward. The high-Ni, Fe clays are brownish-yellowish in color under the microscope. Some of the clays are also quite rich in S (? 66,000 ppm). The Ni/(Fe+Ni) atomic ratio of the clay is highly changeable (0-0.7), and does not show any correlation with the S content. However some incompatible trace elements (Nb, Sr, Zr and Ti) are strongly depleted in the high-Fe, Ni clays, their rare earth element features are similar to those of Avacha silicic glasses and/or the host andesite. In addition, some clays show extremely PGE enriched features, and the concentrations of Os, Ir and Ru in the clays are 106 times higher than the chondrite values. Geochemical features of minerals around the high-Ni, Fe clay clearly indicate that the clays are an alteration product from the metasomatic agent that drastically enhanced the Ni content of surrounding minerals. Possible candidate of the metasomatic agent is sulfide, but we can deny the possibility because there is no Ni enrichment halo around intact sulfides in sample #159. We propose that the high-Ni, Fe clays were peculiar silicate melt or silicate-bearing aqueous fluid with high concentrations of Ni, Fe, S and PGE, and it possibly plays an important role in mobilization of transition elements and PGE within the mantle wedge.

キーワード: 白金族元素, 遷移元素, かんらん岩捕獲岩, マントルウェッジ

Keywords: platinum-group elements, transition elements, peridotite xenolith, mantle wedge

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## Geochemical, Petrological and Environmental Tectonomagmatic dykes in north of Rabor (Southeast of Iran)

## Geochemical, Petrological and Environmental Tectonomagmatic dykes in north of Rabor (Southeast of Iran)

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The study area is inclusive some dykes located in the Kerman province, 10 km north of Rabor. Geologically the area is in the Central Iranian, located volcano-plutonic zone of Urumieh- Dokhtar and southeastern Dehaj- sarduiyeh belt. These dykes have partly ordered array with process dominant north- south and are thickness intermediate 4 meters. These rocks are andesite and dacite in composition with porphyric texture at age Miocene- Pliocene that intruded in the Eocene pyroclastic rocks and Miocene sedimentary units. phenocryst minerals and basic constitutive this rocks are composed of plagioclase, amphibole, biotite and somewhat pyroxene. These minerals somewhen attendants with vitrophyr are in background these rocks. Phenocryst this rocks special plagioclase minerals show disequilibrium textures such as oscillatory zoning, soluble and sieve texture. Peer this disequilibrium structures more due pressure decrease and changing pressure water vapor is in the season those form. In microscopic section dominant texture porphyric this rocks, but in those may observe microlitic porphyric, hyaloporphyratic and microgranular textures. Based on geochemical studies, denote that inverse increase content silica oxide, alkali element oxides, contents Rb, Ba, Sr, Pb, elements increased and other oxides and V, Y, Co, Ni, elements decreased. Changing positive Ba, Rb, U, Th, Pb, Ce, Cs, La and Sr elements, negation V, Cr, Ni, Yb elements this rocks than chondritic normalization and primitive mantle normalization may due work fluid subduction zone and or differentiation minerals such as pyroxene and hornblende. Beside negation anomaly Nb and Ta elements this rocks probably product those contamination with crustal material. Changing increasing ratios Th/Zr, Ce/Y with stable ratio Zr/Nb in the rocks, probably due efficacy dehydration slab subduction is in the mantle wedge metasomatism. Geochemical instance various such as high LREE contents this rocks rather than HREE contents and high LILE/HFSE ratios show those probably formed in the seat continental margin correlate subduction and melting mantle wedge due dehydration slab subduction. Field survey, geochemical and structural this dykes show that probably fractions result activity Sarduiyeh and Dehshir- Baft fault adequate in those forming.

Keywords: Iran, Kerman, Rabor, Petrology, Geochemistry, Andesitic dykes

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## Geology, mineralization and alteration in Nehbandan Mahor Mine, West Lut Block of Iran

## Geology, mineralization and alteration in Nehbandan Mahor Mine, West Lut Block of Iran

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The study area is situated within the Lut Block 130 Km east of Nehbandan. The oldest exposed rocks are cretaceous limestone and conglomerate. Dacite-rhyodacite lava and pyroclastic rocks erupted over oldest rocks. Volcanic activities in Tertiary time consist of andesite, trachyandesite, basalt-andesite, dacitic tuff and rhyolite in composition. Plutonic rocks mainly consist of granite, diorite, granodiorite and monzonite. Volcanic rocks are K-rich calc-alkaline. The pattern of spider diagram in comparison with mantle, they are enriched in Cs, Ba, Rb, and Zr and depleted in Nb, K and Ti. In this area alteration zones are silicified, propylitic, sericitic and argillic. Mineralization associated with volcanic rocks show signs of Ag, Au, Zn, Pb and Cu geochemical exploration anomalies.

キーワード: Nehbandan, Geochemical exploration, Alteration, Mineralization, Mahor, Iran

Keywords: Nehbandan, Geochemical exploration, Alteration, Mineralization, Mahor, Iran