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

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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 $MnO_2 \bullet nH_2O$. 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, $MnO_2 \bullet nH_2O$ 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.

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