Experimental study of metasomatism from cerussite to galena at 150°C

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Replacement texture is a feature that is commonly observed in ores. Many studies have been conducted on replacement textures [1-4]. One of the experimental researches from carbonate to sulfate mineral has indicated that the metasomatism from siderite ($FeCO_3$) to erdite ($NaFeS_2 \cdot 2H_2O$) and pyrite (FeS_2) was proceed at 150°C [5].

Experiments on metasomatism were performed in the cerussite ($PbCO_3$) - aqueous NaHS solution system. We changed duration (1 to 30 days), concentration of aqueous NaHS solution (0.1 and 1.0 mol/l). The reaction temperature was 150°C. Reaction mechanism was considered based on the microscopic and SEM observations of the mineral texture and chemical analysis of experimental solutions.

The variation of pH could not be recognized in this study. The peaks of galena (PbS) were detected by X-Ray diffraction analysis. The intensity of peaks of galena increased with time. The metasomatism was easy to proceed in the initial stage. It is considered that the reaction rate occurring in initial stage was high due to the wide contact area between solution and unreacted material. The metasomatism was easy to proceed as the concentration of the reaction solution was higher. Galena crystals grew toward the inside of unreacted cerussite accompanying a lot of micropores, since molar volume of galena (31.495 cm^3) is smaller than that of cerussite (40.60 cm^3). The reaction solution could easily penetrate through the reaction layer to reach the unreacted cerussite. The tendency in the thickness variation of chipped sample with time could not be recognized in the metasomatism. Therefore, the replacement texture from cerussite to galena was classified into the pseudomorphic replacement texture [1, 2, 6].

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Characteristics of Strontium and boron isotopes of ancient salt deposits in southeastern Laos and their geological implications

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From many drills, several thick sequences of salt deposits containing sylvite and carnallite were discovered in southeastern Laos. In order to constrain the origin of the brine that formed thick sequences of salt mineral deposits, we measured strontium and boron isotope composition of some salt minerals in the cores. Boron isotope composition of the halite and potash-associated minerals in the deposit varies from 19.91 to 31.01‰, which is very close to that of marine evaporites. The $^{87}Sr/^{86}Sr$ ratios (0.707542 to 0.709461) of the salts are very close to the values of the Cenozoic seawater (from the late Cretaceous to the Miocene, the value ranged from 0.707 to 0.709). Moreover, the content of Br^- (0.01-0.25%) and $Br\times10^3/Cl$ ratios (0.10-0.52) of halite in the salt deposits are more than 10 times higher than that of the common continental salts. All of these characteristics indicate that the ancient salt deposits in southeastern Laos from the late Cretaceous to the Miocene were deposited from seawater invasion. According to the depositional environment of the world potash deposits, large-scale potash deposits are commonly formed in the marine environments. Hence, the results of recent regional drilling work and geochemical research suggest extensive potash resources should be expected in ancient salt sequences of Tagong Formation (E_1tg) of southeastern Laos.