

## Pyrite Recrystallization Experiments by Circulating Hydrothermal Solution

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Pyrite is one of common sulfide minerals of hydrothermal deposits and sea-floor sediments from hydrothermal fumaroles. Hydrothermal fluid flow plays an important role in migration and fixation of elements through crystallization of minerals. In this study, we tried to reproduce pyrite crystallization with one-way flowing hydrothermal fluid.

We designed a fluid circuit circulating hydrothermal fluid by thermal convection. A rectangular circuit (42.6 cm by 17.3 cm) of SUS316 pressure tubes with 5 mm in inner diameter was used as a reaction vessel. In the circuit, pyrite dissolves in upstream region and flows in the flowing fluid. And then, pyrite will crystallize again in downstream region as temperature decreases. The rectangular plane was held to be 20 degrees inclination for thermal convection. One of the long sides of the rectangular was heated by an electric furnace.

Starting materials were put in a tube to be heated. Upper half, approximately 20cm, of the tube was filled with quartz sand. Next quarter of the tube was filled with equivalent mass mixture of quartz sand and pyrite. The lowest quarter of the tube was filled with mixture of quartz sand, pyrite, anhydrite and sulfur, those mass are equivalent. The solution was a mixture of 0.5mol/l HCl and 3.0mol/l NaCl.

Maximum temperature was controlled to approximately 350 degree C at the center of the longer side, where was the upper boundary of the pyrite starting material. Experimental durations were 1, 3 and 9 days. After the experiments, the run products were fixed with resin, and vertical sections were observed by SEM.

In the run products, pyrite reacted with solution and dissolved at the lower part of the starting material. As pyrite dissolves, solution composition changes, and products such as  $\text{FeSO}_4$  and / or FeO are observed. In the highest temperature area, pyrite dissolved and  $\text{Fe}_{1-x}\text{S}$  formed temporarily. In the upper half of the sample tube, tiny framboidal aggregates of pyrite occur in high temperature region in where fluid should be vapor phase. Pyrite may be crystallized by cooling of acidic vapor.