Natural analog of the deep geothermal reservoir -Hitachinai Granitic Rocks-

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In present, temperature of geothermal fields operating in Japan ranges from 200 to 300 °C, and depth ranges from 1000 to 2000 m. In operating geothermal reservoir, mechanical behaviors of the rocks is presumed to be brittle. New target of geothermal resources is in 2000-5000m depth and temperature is more than 350℃.In this region, the mechanical behavior of the rocks is considered to be ductile and it is expected to prevent induced seismicity. Furthermore, it is expected to high enthalpy in supercritical state.
Lithostatic-hydrostatic pressure transition zone that is important to the deep geothermal development is estimated by previous study related to the deep geothermal resource. Therefore the purpose of this study is obtaining an evidence of the transition and proposing the natural analog of the deep geothermal reservoirs. Thus, we investigated granitoid that is thought to be a heat source. And we also investigated mineral filling veins and alteration zone. Further, we analyzed chemical composition of minerals and the fluid inclusion of the rock samples.
Many volcanoes and calderas are distributed in Tohoku district. In previous study of the Koaizawa-Ohmizuhata granitic rocks located in west of Tazawa-ko lake in Akita Prefecture, Tohoku District, NE Japan, a granite-porphyry system is proposed as a natural analog of the deep geothermal reservoir. Fournier(1999) suggested that the veins including magmatic fluid formed under lithostatic pressure condition and the granite body is accompanied by alteration of porphyry-copper type with self-sealing zone.
In this study, we investigated the Hitachinai granitic rocks, located in north of Tazawa-ko lake complex rocks in central Akita Prefecture. It is expected the material evidence of the lithostatic-hydrostatic pressure boundary in the granite body.
As a result of field survey, silicified zone and argillized zone in alteration zone. Further, several kinds of mineral filling veins were observed with it, too. Mainly, those were quartz vein, glassy vein and hydrothermal breccia vein. We evaluated depth and temperature of geothermal fluids. Which of magmatic fluid or hydrothermal fluid participates in the vein formation is thought that related to the stage to change from lithostatic to hydrostatic pressure, and we expect that it leads to new knowledge of the deep geothermal reservoir. In this presentation, we estimate geothermal potential based on petrologic, mineralogic and fluid inclusion study of host granitic rocks and mineral filling veins.

Keywords: the deep geothermal reservoir, brittle-ductile transition zone, geothermalfluids, mineral filling veins

