

Geological and geochemical characteristics of acidic wells in Hatchobaru geothermal field, Oita, Japan

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The Hatchobaru geothermal field is located in Oita Prefecture, Kyushu Island. Hatchobaru geothermal power plant has been operating since 1977 by Kyushu Electric Power Co., Inc. (KEPCO) in this field. Injection wells are located in the northern sector of the exploitation area and the production wells are in the southern sector. In Hatchobaru field, geothermal fluid is stored mainly along the NW and NE trending faults. The geothermal reservoir is water-dominated, neutral-chloride fluid, with fluid temperature ranging from 240 to 300°C (SiO₂ geothermometer) (Momita et al., 2000). Most of production wells produce neutral to alkaline fluid. However, some wells discharges acidic fluid (Shimada et al., 1983, Matsuda et al., 2000). Acidic fluid causes corrosion in casing and surface facilities such as pipe lines. Presence of acidic fluid in geothermal reservoir is one of a big issue for geothermal exploration and for sustainable power plant operation. Understanding of distribution of acidic fluid and origin of acidic fluid is desirable to mitigate resource risks caused by the acidic fluid in geothermal development. The aims of this study are to understand distribution of acidic fluid, to identify the origin of acidic fluid and to construct fluid flow model the acidic fluid.

In Hatchobaru geothermal field, alteration minerals such as alunite, kaolinite, pyrophyllite occur widely at the shallow depth (1,000m to 500m asl.) at subsurface. In the deep level, clay minerals such as Illite, chlorite and mixed layer minerals are continuously observed in well geology (Taguchi, 1991). The spatial distribution of alteration minerals at subsurface infers that the acidic fluid is stored mainly at the shallower depth in Hatchobaru field. However, some production wells which has feed zones at the deep level discharges acidic fluid. Considering these observations, there still remains uncertainties of distribution, origin and flow model of acidic fluid in Hatchobaru field.

In this study, aiming to characterize the mineralogy and distribution of alteration minerals in the acidic and neutral-alkaline fluids environment in Hatchobaru field, well geological and mineralogical studies was conducted by performing petrographic observation and X-ray diffraction analysis (XRD).

The result of XRD (bulk sample) study shows; 1) In the shallow depth, the acidic alteration minerals dominates at the shallow depth (1,200m to 400m asl.) regardless of pH of fluid discharged from the wells, which zone is regarded as acidic alteration zone. 2) Illite, chlorite and mixed layer minerals occur below the acidic alteration zone regardless of pH of fluid discharged from the wells. 3) Acidic alteration minerals are not identified near the feed zones of the wells which discharge acidic fluid.

In the results of bulk analysis of XRD, differences of mineral assemblage and spatial distribution of alteration minerals are not found among the wells discharging acid fluid and neutral-alkaline fluid.

In the presentation, detailed study results such as XRD analysis (oriented sample), observation of thin section will be presented and discussed the distribution, the origin and fluid flow of acidic fluid in Hatchobaru field.

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