

Cooling history by using dating and fluid inclusion data at the southern part of Kii Peninsula, Southwest Japan

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High temperature hot springs such as Yunomine (92.5 degree C.), Kawayu (70.0 degree C.), Tosenji (51.2 degree C.) and Kamiyu (57.8 degree C.) are distributed around the southern part of Kii Peninsula, though no Quaternary volcanoes exist around there (Kinbara (ed.), 2005). Moreover, Hongu area, including Yunomine hot spring, is known as geothermal extraordinary area that several alteration zones originated by the geothermal activities, are identified (NEDO, 1994). On the other hand, Kumano Acidic Rocks, Ohmine Granitic Rocks, and a lot of quartz porphyry veinlets related these acidic rocks are distributed in the southern part of Kii Peninsula, whose activities are considered as ca. 14 Ma by K-Ar dating (Sumii et al., 1998; Sumii and Shinjoe, 2003; NEDO, 1994). And Several tens of vein-type ore deposits like as Kishu mine and Myoho mine are distributed mainly around Kumano acidic rocks (ANRE, MITI, 1989).

K-Ar dating, fission track (FT) dating, and thermoluminescence (TL) dating of altered samples are executed in order to understand the alteration age of these geothermal activities. Besides, in order to understand the temperature and chemistry of hydrothermal solution, fluid inclusion analyses of altered minerals from the alteration zones around gushing out points of the hot springs and mineralization area, are executed.

Results of dating, zircon FT age seems to show the forming age of source materials. K-Ar age of sericite seems to show the forming age of sericite by high-temperature hydrothermal alteration, and the hydrothermal activities seem to have relation to the volcanic activities. Apatite FT age seems to show the reset age by burying after sedimentation (ca. 10 Ma) and the reset age by low-temperature geothermal activities at Tosenji and Yunomine (2.5 ~ 5 Ma). TL age shows the younger age than the age using by other dating methods in each area.

Results of fluid inclusion analyses, hydrothermal solution of middle to high temperature (under 200 degree C.) and middle to high salinity (under 1 wt% NaCl) are identified. Moreover, at Heijigawa area, hydrothermal solution of low temperature (~180 degree C) and low salinity (~0.5 wt% NaCl) are identified, too. This hydrothermal solution of low temperature and low salinity is thought to be the same kind of the solution by the low-temperature geothermal activities at Tosenji and Yunomine.

At the results of dating, the high-temperature geothermal activities are ca. 14 Ma, and the low-temperature geothermal activities are from ca. 5 Ma to the present time. So, it is thought that high-temperature geothermal activities caused by the acidic volcanic activities and low-temperature geothermal activities caused by the hydrothermal solution, provided with heat and gas from deep solution below these area (Umeda et al., 2006).

References

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