

Geochemical study of hot springs in and around the impermeable rocks - Proposal of a new silica geothermometer and flow system -

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Major and minor chemical constituents in sixteen hot spring waters from the wells in and around the western impermeable rocks(Sanbagawa belt), Saitama prefecture, were analyzed. From the analytical data, we proposed the silica geothermometer, and discussed flow system of the deep waters and its water-rock interaction to make chemical properties of the waters.

Based on the chemical analyses of the discharged waters and the temperature logging for five deep wells, an empirical relationship developed between the concentrations of SiO₂ and the reservoir temperature. The evaluated temperature can be explained by:

$$T=1830/(7.478-\log\text{SiO}_2)-273.15 \text{ (SiO}_2\text{:concentration of SiO}_2\text{,mg/L)}$$

The hot spring waters are divided into Na-Cl and Na-HCO₃ types in the field. The deep waters reserved in the impermeable Sanbagawa belt, and the Neogene sedimentary rocks belong to Na-Cl type, and Na-Cl and Na-HCO₃ types, respectively. As it is inclined that brine fraction in the discharged waters for the latter and deep water temperature estimated by the silica geothermometer decrease from the east to the west, the deep waters seem to be formed by mixing of the deep seated fossil brine with the meteoric water infiltrated from the Kanto mountainland. On the other hand, the Na-Cl type deep waters in the Sanbagawa belt are probably flowing upward along fractures developed in the Kanto mountainland.