Geochemistry of geothermal fluids in Moil Valley geothermal field, NW Iran

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The Moil valley geothermal field is located in the northwest of Sabalan volcano in the northwest of Iran. The geothermal activities attributed to the Sabalan volcano was intensified during Plio-Quaternary time and the manifestations of these activities are observable around the volcano especially in the northwestern corner. The hot springs, surficial manifestations, and extracted fluids from drilled wells represent the whole composition of underground reservoir fluids. The thermal measurement of fluids show wide ranges of temperature of fluids where the hottest spring show 89°C and the fluids obtained from well samplings show maximum temperature of 202°C.

The reservoir temperature estimations based on different geothermometers show 250°C for the reservoir. The interpretation of carried out chemical analyses represent Na-K-Cl dominant composition for the studies samples taken from hot springs and drilled wells. All of sampling stations show pH ranges of 4.2-7.6 which reveal acidic to neutral pH range. The variation of TDS for the studied samples ranges between 209 to 320 mg/L. The evaluation of correlation coefficients between main parameters gives notable results. The positive and good correlation coefficient between temperature and Cl is obvious in most of samples and consequently the Cl content of samples increases in high temperature samples.

Boron as a key constituent in geothermal fluids show variable concentrations in Moil Valley geothermal fluids and shows 0.28-35 mg/L Boron content in the studied samples. The correlation between Boron and pH for the studied samples is positive. This correlation displays the highest concentrations in pH=7. The main Boron species in this pH value is B(OH)3 which is more stable comparing to the other Boron phases.

The stable isotope analyses of the studied samples show -12 to -9.1‰ for δ18O and -71.3 to -77.6‰ for δD. The interpretation of obtained δ18O and δD values represents the main role of meteoric waters in reservoir fluids of Moil Valley geothermal field. Magmatic waters show negligible share of the reservoir fluids.

The Tritium analyses for the studied samples show 0.1 to 41.7 TU amounts. The evaluation of
obtained Tritium contents reveals the circulation of young waters inside the reservoir and considering to the δD/δ¹⁸O ratios, it is most likely that the recharge zones of the reservoir are situated in close distance and there are evidences of mixing with meteoric waters.