



Hydrogeochemistry and Geothermometry of Ramsar Thermal and Mineral springs, North of Iran.

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The Ramsar thermal springs are situated in northern mountainous of Alborze structural zone, this area have NW-SE trend and created by density of folding and faulting systems.

The climate in this area is wet and hot in summer, and cold in winter. The annual precipitations are more than 976mm, mainly of precipitation in winter are snowy and cause established natural and permanent glacial at highlands.

Several thermal and mineral springs are situated in the south and southeastern flank, Electrical Conductivity and PH of these springs range from 1050 to 21600 and from more than 5.5 to 6, respectively.

The temperature of these springs has range from about 20 to 65°C. Most of the thermal springs are of sodium-chloride type (piper diagram), Besides, they are mature and full equilibrium according to Gigeenbach triangular diagram ($Na/1000-K/100-\sqrt{Mg}$), The only exception is sample H5 (Safaroud spa) that is close to immaturity field, maturity of thermal springs water and low pressure of CO_2 supported deep circulation for these water and because of long contact time equilibrium between crustal rocks and thermal waters. Positive correlation between Cl and Mg shows that mixing of surface water in the thermal system is insignificant. The $SO_4-Cl-HCO_3$ triangular diagram confirms mature and deep origin. Thermal water of Ramsar in study area is supersaturated in respect to Quartz, Clay minerals, Barite, Alunite and Aragonite and under saturated in respect to chalcedony, carbonate, SiO_2 (a) and gypsum phase. Saturation index is calculated using PHEERQCI software. XRD analyses reveal the Montmorillonite, illite, Alunite and quartz in Ramsar Spring sinters.

The geothermometric studies results are reliable because some of the water samples are mature water and depended full equilibrium water- rock interaction zone. The reservoir temperatures of Ramsar Springs evaluated with equal Na-K and Na-K-Ca geothermometer and have range between 90 to 280°C, and comparison with argillic alteration zone.