

Characteristics of low and high sulphydation in the active hydrothermal systems of Los Azufres, Mich. and Los Humeros, Pue. Mexico

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The deep hydrothermal alteration in Los Azufres geothermal field is mainly calcosilicates. On the surface, there is a zone of advanced argillitization. Present day deep fluids, related to propylitization, are of a sodic chlorated type with neutral pH. The deep brine, determined in fluid inclusions in drill cuttings, has salinities of 0.1 to 1 %, Eq. Weight of NaCl and Th = 340° to 300° C., P 175 bars; boiling point occurs at Th = 270° ± 10°C and P = 75 bars and Tmi = - 0.6°C to a - 3°C. Boiling seems to control sulphide precipitation, as well as the isotopic tendency ($\delta^{34}\text{S}$, δD and $\delta^{18}\text{O}$ ‰), thus favoring oxidation in the hydrothermal fluids.

In the geothermal field of Los Humeros a deep acid alteration zone, related to magmatic degasification is present with SO_4 , B, As, HCl, HF and pH \cong 2 – 3. Closer to the surface, in the region where magmatic and meteoric fluids mix, there is a zone of propylitic alteration. The fluid inclusions show in the deeper zones (2200 m), salinity of 0.18 to 0.35 %, Eq of NaCl and Th = 335 ± 10°C. This overheated steam fluid is the cause of the acid alteration, approximately at 300° and ±1500 m depth it boils, showing salinity of 0.71 to 3.39% Eq of NaCl. The isotopic behaviour δD ‰, $\delta^{18}\text{O}$ ‰, $\delta^{34}\text{S}$ ‰ and $\delta^{13}\text{C}$ ‰, both agree with the existence of an active hydrothermal system in which the magmatic participation is important.