F and Cl in sericite evidence of volatiles fugacity of hydrothermal fluids in Hamand porphyry copper deposit, SW Birjand, Iran

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The systematic compositional variations of sericite through the different alteration zones within Hamand porphyry copper deposit used as an evidence for specifying halogen fugacity ratios of associated hydrothermal fluids. Sericite from the potassic zone (X_{Ser} = 0.94) possesses a moderate F content (0.1 to 0.69 wt.%) that is significantly higher than in argillic zone (0.08 to 0.31 wt.%), producing a positive correlation with X_{Mg} and negative correlation with Cl. The systematic variation of the logarithmic halogen ratios reflects a systematic variation of the F/Cl in sericites through different alteration zones. With a decrease in temperature, the log (fH_2O/fHF) and log ($fH_2O/fHCl$) values calculated for fluids equilibrated with sericite increase progressively from potassic to phyllic to argillic zones. The decrease in halogen content of hydrothermal fluids towards outer parts of the deposits reflects an increase in the degree of mixing between magmatic fluid and meteoric water.

Experimental equilibrium constants are following:

$\log K_{sericite} = \log (X_x/X_{OH})_{sericite} + \log (fH_2O/fHX)_{fluid}$, $\log K^*_{sericite} = 2100/T + 1.523(X_{Mg}) + 0.416(X_{Fe}) - 0.11(X_{Al})$,

The fugacity ratios of halogen-hydroxyl exchanges in the hydrothermal fluids are calculated using a combination of both equilibrium constant formulas. These are:

$\log (fH_2O)/(fHF) = \log K^* - \log (XF/XOH)$, and

$\log (fH_2O/(fHCl) = \log K^* - \log (XCl/XOH)$.

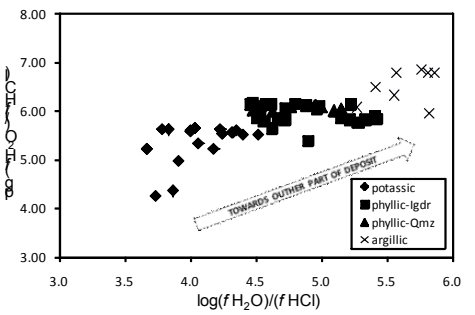

Figure 1. Log (*f*H2O)/(*f*HF) against log (*f*H2O)/(*f*HCl) plot, defining the fugacity ratios of hydrothermal fluids.