Thermodynamic evolution of the magnesian iron skarn from the Galinge Fe skarn deposit in Qinghai, western China

MIAO YU[1], JEFFREY M. DICK[1], JINGWEN MAO[2], A, CHENGYOU FENG [2], BIN LI[1],

[1] Key Laboratory of Metallogenic Prediction of Nonferrous Metals and Geological Environment Monitoring, Ministry of Education, School of Geosciences and Info-Physics, Central South University, Changsha 410083, China

[2] MLR Key Laboratory of Metallogeny and Mineral Assessment, Institute of Mineral Resources, CAGS, Beijing 100037

The Galinge iron deposit in the Qiman Tagh orogen, western part of the East Kunlun, Qinghai province, occurs as lens-shaped magnesian skarn, with magnetite and base-metal sulfide orebodies, and is hosted in dolomitic limestone. It experienced a complete skarn and retrograde stage under varying fluid compositions resulting in thermodynamically controlled formation of magnesian skarn and mineralogical zonation. A thermodynamic model setting pressure of 50 MPa (P_f = P_s = 50 MPa) was set up to trace the skarn evolution. The X(CO_2) of 0.3 and 0.01was set up in the skarn stage and retrograde alteration stage, respectively. Magnetite is stabilized at fluid conditions of ca. 460 – 520°C and Δlog fO_2 (HM) = -5 – -11 in the skarn stage, and co-precipitates with diopside, forsterite and dolomite. Magnetite precipitation always shows strong relations with diopside and forsterite rather than fayalite and hedenbergite, which deplete iron from the fluid.

The retrograde alteration stage is characterized by the formation of tremolite, phlogopite, serpentine, magnetite and ludwigite. Most of the tremolite + diopside + magnetite assemblages are stable at 360 – 460°C and Δlog fO_2 (HM) = -16 – -5. The phlogopite is formed at a temperature range of ca. 360 – 420°C and Δlog fO_2 (HM) = -11 – -6, and serpentine are stabilized below 460°C in the late retrograde stage. Their stability in the system are intensively effected by the Al_2O_3 activity of the fluid-rock system. The paragenetic sequence of retrograde minerals is most likely a result of internally buffered increasing oxidation state as the precipitation of magnetite. This suggests that oxidizing process is most important for understanding the major causes of magnesian skarn iron deposit formation in other areas.

Keywords: Galinge skarn deposit; skarn zonation; magnesian skarn; thermodynamic model