Reconstruction of the paleo-fluid flow in the W-(Sn) veins system of Panasqueira

GAËTAN LAUNAY[1,2*], STANISLAS SIZARET[2], LAURENT GUILLOU-FROTTIER[1], ERIC GLOAGUEN[1], FILIPE PINTO[3]

[1] BRGM, ISTO, UMR 7327, BP 36009, F-45060 Orléans, France (g.launay@brgm.fr, l.guillou-frottier@brgm.fr)
[2] Université d'Orléans, ISTO, UMR 7327, F-45071 Orléans, France (stanislas.sizaret@univ-orleans.fr)
[3] Sojitz Beralt Tin & Wolfram, S.A., Geology Department, Barroca Grande, Portugal

The Panasqueira W-(Sn) deposit (Portugal) consists as a dense network of flat wolframite and cassiterite-bearing quartz veins concentrated in the vicinity of a hidden greisen cupola. Previous studies (Thadeu 1951) have suggested that the Panasqueira deposit is genetically related to magmatic activity for which the most part is unexposed, and being only represented by the greisen cupola. However, genetic relationship between granitic intrusion and veins system remains debated. Study realized by Polya (1988) suggests that the hydrothermal circulation is mostly controlled by faults and not by the cupola. This study aims to highlight the role of the cupola on fluid flow based on original approach focused on the growth bands of tourmaline (Sizaret et al. 2009).

Tourmaline is ubiquous along schist vein contact and was formed during the first stage of vein opening (Poyla 2000). Intense tourmalinisation of schist close to veins suggest that the tourmaline crystallization is related to the circulation of hydrothermal fluid in the vein system. Oriented veins samples have been collected at different places around the cupola to have a good spatial distribution. To estimate the fluid velocity and direction we use an inverse method based on measures of the growth band thickness (d_{max}, d_{min}) on thin sections perpendicular to the c-axis of tourmaline. The direction of d_{min} gives the flow direction and the fluid velocity is calculated from a function between the flux ratio of upstream/downstream flow (d_{max}/d_{min}) and the flow rate.

The spatial repartition of flow directions and fluid velocities converge toward the greisen cupola suggesting that hydrothermal fluid was expulsed from the granitic intrusion during first mineralization stages. The relative high fluid velocities (10^{-4} to 10^{-3} m/s) confirm that hydrothermal fluid is channelized in veins during their opening.

A such this fluid circulation pattern has been validated by numerical modeling of heat and mass transfer around a granitic intrusion. Consequently the cupola is an important emenative center of hydrothermal fluid and plays a major role during the hydrothermal circulation.