Study on geochemical information of quartz fluid inclusions of Longshan gold-antimony deposit in Hunan Province, China

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Longshan gold-antimony deposit is a large deposit in Hunan Province, China. To find the mineralization law of the deposit, researchers try to clarify the relationship between Geochemical information of fluid inclusions in quartz and mineralization of the deposit used by Quartz specimens of the ore-forming stage.

Based on the analysis of gas Components liquid components of fluid inclusions in quartz, it can be found several laws as follows:

1. The components of Ore-forming fluids mainly are H_2O and CO_2 with a little of H_2, CH_4 and N_2. There is no CO in ore-forming fluids.
2. From the west to east of ore vein, the quantity of CO_2/CH_4 increases more and more, Which can be concluded that the degree of oxidation turns more and more high.
3. Compared with Main vein, there are more volatilization and more high degree of oxidation in offshoot vein.
4. The main components of Anionic are Water-soluble sulfur species with a lot of F^-, Cl^-. There is Proportional relationship between the content of Anionic and the content of SO_4^{2-}.
5. Na^+ is the main component of Alkali metal cation, but there are a lot of K^+ and Li^+in some specimen.
6. There are many types of component such as K^+-Na^+-Mg^{2+}-Cl^--SO_4^{2-}, Na^+-Mg^{2+}-Cl^--SO_4^{2-}, Na^+-Ca^{2+}-Mg^{2+}-Cl^--SO_4^{2-} and Li^+-Na^+-Mg^{2+}-Cl^--SO_4^{2-}.
7. The mineraliziton degree is more high, the component of the liquid is more complicated,
8. when the fluid inclusion homogenization temperatures is more high, the value of F/Cl is more large, and the value of K^+/Na^+ is more small.
9. The value of F/Cl of Brecciated quartz is more small than which of vein qiartz.

In a word, it can be concluded that the ore source is Magmatic hydrothermal, and it comes from deep zone.

Li isotope partitioning between serpentine phases and fluid

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Lizardite and chrysotile form during hydrothermal alteration of the oceanic lithosphere and react during increasing metamorphism to antigorite, which is stable in subduction zones to upper mantle depths. Serpentinites are hosts for fluid-mobile elements as e.g. Li. As Li and its isotopes are important geochemical tracers in subduction zone environments, we present here quantitative data on experimentally determined Li isotopic fractionation between serpentine varieties and coexisting fluids. In this study, Li incorporation into Fe-free serpentine follows the substitution mechanism $Li^{[6]} + Al^{[6]} \leftrightarrow 2Mg^{[6]}$.

The serpentine phases were synthesized from stoichiometric talc and brucite mixtures adding small amounts of γ-Al_2O_3 and Li_2O. Experiments were performed in the P,T-range 2-40 kbar, 200-500°C with H_2O in excess. Phase determination was done by powder-XRD with Rietveld refinement and verified by TEM and IR spectroscopy. Lizardite formed at 200-300°C, 2-4 kbar, chrysotile at 400°C, 4 kbar and antigorite at 500°C, 40 kbar as main serpentine phases.

Li-isotopic fractionation between the serpentine phases and fluid gave astonishing results: For lizardite, antigorite – fluid ^7Li preferentially fractionated into the fluid and Δ^7Li-values followed the T-dependent fractionation of Li-mica – fluid [1]. For chrysotile – fluid, however, ^7Li slightly fractionated into chrysotile. This difference might be due to different Li environments in the three serpentine phases: in lizardite and antigorite Li is six-fold coordinated, whereas in chrysotile Li is (mainly) incorporated as $Li(H_2O)_4^+$-cluster filling the nanotube cores. IR-spectra of chrysotile showed small but significant amounts of water, which has a suppressed freezing point of about –35°C due to the confined geometry.

We propose that prior to the complete chrysotile dehydration, the heavy Li bearing fluids in the nanotubes may be released at relatively shallow levels during subduction. Thus, slabs with different serpentine types produce fluids with varying Li isotopic compositions, leading to the presence of domains with light and heavy Li, respectively.

[1] Wunder *et al.* (2007) *Chem. Geol.* **238**, 277-290.