Ore genesis of the Longshan Sb-Au deposit, Hunan, China: Evidence from fluid inclusions

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The Longshan gold-antimony deposit is one of the typical Sb-Au associatioins in Hunan province, China. The mineralization is related to NWW and NNE trending fault systems and hosted within gravel sandy slate in Jiangkou Formation of Sinian System. Gold occurs mainly in cracks in stibnite, pyrite and arsenopyrite, or in the contact area of these three minerals and gangue minerals, or enclosed by stibnite. From a limited number of hydrogen and oxygen isotope data, some previous workers proposed that the ore-forming fluid was predominantly meteoric in origin. In contrast, we argued that metamorphic fluid is an alternatively likely source of the ore-forming fluid based on a preliminary study of fluid inclusion microthermometry and Raman spectrum.

Mineralization and paragenesis of the Longshan deposit can be divided into three stages as follows based on geology and petrography of the deposit: Qz + Py +Asp +Au (stageI); Qz + Py +Asp + Sb + Au (stageⅡ) ; Qz + Sb + Cal (stageⅢ). StageⅡ is the mainest ore-forming stage accounting for approximately 82% of ore reserves. Primary inclusions in quartz from stageⅡ ores are mainly mixed aqueous-gaseous fluid inclusions (H_2O–NaCl–CO_2-other gases). Pure liquid and pure gaseous can be occasionally observed. For mixed aqueous-gaseous fluid inclusions, two or three phases can be observed at room temperature: a bubble of carbonic vapor suspended in aqueous liquid, or a double bubble in which a bubble of carbonic vapor is enclosed by a bubble of carbonic liquid suspended in aqueous liquid. The size of inclusions ranges from 2.31μm to 12.89μm, mainly 3μm to 7μm. These inclusions exhibit relatively variable vapor to liquid ratios (5-25%, mostly 10-15 percent vapor by volume), and have homogenization temperatures ranging from 235℃ to 320℃. Two-phase inclusions show a wide salinity range of 0.18-9.85wt% NaCl equiv, with most data clustering around 3-8 wt% NaCl equiv. By contrast, three-phase inclusions have a lower range in salinity (1.42-2.2 wt% NaCl equiv). Trapping pressure estimated from three-phase inclusions is up to 135MPa, suggesting that antimony-gold mineralization occurred at the depth of approximately 7.7km. Laser Raman Spectrum analysis for two-phase of CO_2-H_2O inclusions indicate the existence of minor N_2 and C_2H_6 besides CO_2. Physical and chemical characteristics of fluid inclusions suggest that the Longshan Sb-Au deposits may have resulted from metamorphic fluids.

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Mafic potassic volcanics from the Altiplano, South America: Indication of a dynamic A-type magma source under construction?

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Small volume monogenetic mafic volcanoes, erupted onto the Altiplano (active orogenic platuea) during the Neogene to Quaternary, display high K, F, Ga/Al and low Ca relative to typical basalts. These characteristics match key chemical affinities of post-orogenic A-type granite magmas.

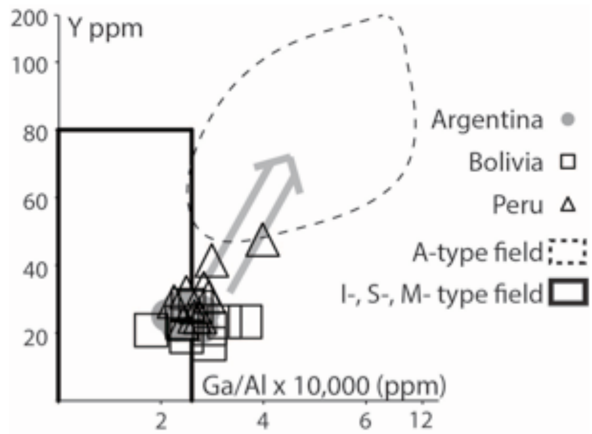

Figure 1. Geochemical affinites between orogenic mafic volcanics and A-type granites. Arrow indicates liquid evolution involving plagioclase and clinopyroxene from a deep crustal reservoir stacked with mantle-derived, low degree partial melts into the A-type field.

New geochemical data and Sr, Nd and Hf isotopic ratios of these Altiplano volcanics are consistent with a petrogenetic model that involves iterative low-degree partial melting regimes within underlying metasomatised aesthenospheric and lithospheric mantle. We consider generation of such melts to be widespread and significant, since the same signatures are observed across ~1750 km of strike length and are not restricted to a specific time period. Their small individual erupted volumes suggest ascending batches are subject to efficient cooling and stalling at deeper levels. Therefore it is plausible they may be vastly underrepresented at the surface, and difficult to directly detect by geophysical methods. Second order convections within the mantle during downwelling/delamination of lithosphere may account for the production and emplacement of these magmas. We propose that the generation of these melts during orogenesis contributes chemical and isotopic signatures to subsequent post-orogenic magmas, via their iterative pooling and crystallisation within the lithosphere.

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