

## W-Sn ores of the Svetloye deposit: Mode of formation from isotope, fluid inclusion and modeling studies

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Large Svetloye W-Sn deposit (Chukotka, North-East of Russia) is located in the apical part of a leucogranite stock. The deposit is composed of a series of quartz veins among the flyschoid rocks ( $T_{1,2}$ ), cut by the dikes ( $K_1$ ). The veins are dominated by the quartz-wolframite-cassiterite-arsenopyrite-muscovite mineral assemblage. The later sulfide and quartz-fluorite-calcite assemblages are of limited development. Fluid inclusion study showed, that productive mineral association was formed by aqueous low-salinity sodium chloride fluids at T 350-270°C, P 0, 5-1, 0 kbar. The remarkable low salinity (<5% mass) was cryometrically found for the earliest magmatic fluids from primary magmatic fluid inclusions and fluid phase of melt inclusions in quartz from leucogranites of the stock. W and/or Sn ore formation was accompanied by increasing in alkalinity and degree of oxidation of fluids. Boiling of ore-forming fluids was rather typical of the central part of the deposit. Isotopic (H, O, Ar) study of minerals [1] and oxygen isotope zonality of host granites witness to precipitation of cassiterite-wolframite ores presumably from magmatic fluids strongly diluted with meteoric waters, interacted with wall rocks.

Analysis of possible role of main factors of W-Sn precipitation, such as cooling, boiling, interaction with wall rocks and mixing of genetically different fluids have been modelled with the help of HCh software package [2]. Natural data are best consistent with model of mixing of ore-forming solutions with exogenic fluid, reequilibrated with host rocks, as it was found for the Sn-W Iultin deposit, situated in the same ore province [3].

[1] Sushchevskaya T. *et al.* (2000) *Geochem. Int.* **38**, Suppl. 2, P. 123. [2] Shvarov Ju. Bastrakov E. (1999) *Australian. Geol. Surv. org.* 56p. [3] Sushchevskaya T.M. Bychkov A.Ju. (2010) *Geochem. Int.* **48**, P.1246.

## Strontium stable isotope variations in lunar basalts

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In the terrestrial environment strontium (Sr) stable isotopes may experience significant fractionation, both at low- and high-temperatures, involving carbonate precipitation [1] and plagioclase crystallisation [2], respectively. Recent data for lunar basalts suggests that these rocks may possess light Sr stable isotope compositions ( $\delta^{88}\text{Sr} = +0.16 \pm 0.07$ ) [2] relative to mantle derived terrestrial basalts ( $\delta^{88}\text{Sr} = +0.30 \pm 0.07$ ) [2, 3]. However, few samples have been analysed thus far, and at the  $\pm 50$  ppm precision of these measurements, obtained using an MC-ICP-MS [2, 3], such variations cannot be clearly resolved.

This study presents high-precision ( $\pm 10$  ppm) double spike TIMs data for  $^{87}\text{Sr}/^{86}\text{Sr}$  and  $^{88}\text{Sr}/^{86}\text{Sr}$  for a suite of lunar basalts and anorthosites. These data confirm the light Sr stable isotope compositions observed previously for lunar rocks [2] but also demonstrate that there are significant and resolvable variations in  $\delta^{88}\text{Sr}$  ranging from +0.348 for a lunar norite to +0.151 for a high-Ti Mare basalt. These variations, taken with those for evolved terrestrial basalts, are most simply explained by the preferential incorporation of the heavy isotopes of Sr into plagioclase with a fractionation factor of  $\sim 1.0002$  for  $^{88}\text{Sr}/^{86}\text{Sr}$  [2]. These results clearly indicate that for the Moon primary igneous processes alone can produce significant variations in  $\delta^{88}\text{Sr}$ , without the recycling that may occur on Earth.

[1] Fietzke, J. & Eisenhauer A. (2006) *Geochem. Geophys. Geosyst.* **7**, Q08009. [2] Charlier, B.L.A. *et al.* (2011) *Earth Planet. Sci. Lett.* Submitted. [3] Moynier, F. *et al.* (2010) *Earth Planet. Sci. Lett.* **3-4**, 359-366.