Trace and rare earth elements characteristics of scheelite from the Sanjiazi tungsten deposit in Siping area, Northeastern China

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The Sanjiazi skarn scheelite deposit is lately discovered in northeast China and there are many key questions on its genesis still unresolved. Scheelite is a widespread mineral in many hydrothermal deposits, its trace and rare earth elements can be used to constrain the derivation of the metal and mineralising fluids [1, 2]. Trace elements and rare earth elements (REE) compositions of the scheelite from Sanjiazi deposit were analyzed by ICP-AES.

Scheelite in Sanjiazi deposit is depleted in Sr, Be, Co, Ni, Ta and with enrichment of such metallogenic elements as Pb, Zn, Mo, Bi and Ag. Generally, these enriched trace elements, together with W, are prone to accumulate in magmatic hydrothermal fluids and precipitate in mesothermal condition. Moreover, scheelite shows accordant primitive mantle-normalized trace element spidergram with the Mesozoic granite and pre-mineralizing diorite porphyry dikes, indicating that they have the common material source.

The total content of REE in scheelite is 134.59ppm. The content of the LREE is nearly equal to that of the HREE. Chondrite-normalized REE patterns of the scheelite are overall flat curves with obvious Eu peak, which indicates a strong LREE/HREE fractionation. Scheelite has strong positive Eu anomalies (δEu=2.05), weak negative Ce anomalies (δCe=0.77), low LREE/HREE (1.09) and $(La/Yb)_N$ (0.54). The REE characteristics of scheelite in Sanjiazi deposit is similar to those in some skarn tungstern deposits in south China associated with magmatic hydrothermal fluid [4].

A conclusion can be safely drawn that the Sanjiazi tungsten deposit belongs to skarn ones, its ore source was derived from the granitic magmatic fluid instead of ore-hosting skarn. The Mesozoic granitic magmatism played an important role in scheelite mineralization in this area.

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REE fractionation during crustal anatexis: Constraints from the South Bohemian batholith (Bohemian Massif)

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The processes controlling rare earth element (REE) behaviour during origin of S-type granite melts have profound implications for REE abundances in these granites. For typical protoliths of S-type two-mica granites, such as are metapelites of the Moldanubian Zone from the Bohemian Massif (Central European Variscides), a high amount of bulk rock LREE are sited in monazite and of HREE in garnet, apatite and zircon. The LREE and Th concentrations of a metapelite-derived melt are buffered by monazite stability. During anatexis, dissolution of monazite, apatite and zircon in the melt results in increasing bulk REE abundances and LREE/HREE ratios with increasing temperature of melting and a negative Eu anomaly in the melt. Both these features are displayed in the REE geochemistry of two-mica granites from the South Bohemian batholith (SBB) in the Bohemian Massif.

Three main geochemical two-mica granite types can be distinguished in the SBB: the low-Th Deštná granite, the intermediate-Th Eisgarn granite and the high-Th Lipnice and Steinberg granites. Th concentrations and REE element patterns are quite distinct class marks for the above mentioned three geochemical types of two-mica granites. The highest bulk content of REE is significant for the Lipnice and Steinberg granites (207–242 ppm), whereas the lowest bulk of REE was observed in the Deštná granites (33–69 ppm). The content of REE is controlled by variable amount of apatite, monazite and zircon enclosed usually in biotite and/or in apatite. The accessory minerals assemblage in the Deštná granite consists of monazite, zircon, apatite and xenotime usually enclosed in K-feldspar. The Eisgarn granitic melt was generated from dehydration melting of biotite at temperatures in the range 830–850 °C, whereas the Deštná granitic melt was generated by dehydration melting of muscovite at temperatures in range 670–750 °C, in agreement with REE concentrations. The highest Th contents in monazite and high Th/U ratios are significant for monazites from the Lipnice and Steinberg granites. On the other hand, monazites from the Deštná granites show higher values of U and Y.

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