Abstract

The Krušné hory-Smrčiny and Cornubian batholiths in Hercynian orogenic belt are well known tin provinces. Despite of their distant location (2000 km) and position in different tectonic zones (Saxothuringian zone and Rhynohercynian zone respectively) they show plenty of significant geological similarities. Both batholiths are nearly of the same age, size, shape, dimensions and orientation. They are characterized by steep sides and flat roof. Geophysical measures indicate etmolithic shape of both the intrusions. NW-SE trending wrench faults dislocate the batholiths into various domal plutons. In both batholith volcanic ejecta have been reported. In Cornwall they are beside the batholith while in Krušné hory-Smrčiny batholith they are intruded by the youngest phase of granites. The primary heat production and heat flow is estimated to be similar in both the provinces. The same can be said about the type and style of mineralization (greisen, veins, and stockworks of Sn ± W, ± Mo, ± Cu ores).

As far the granites are concerned, using statistical methods on geochemical data they have been classified into five groups (G1, G2, G3, G4 and G5). G2 to G4 are common types in both batholiths but G1 is absent in Cornubian batholith. Geochemically, the granites within their groups in both batholiths have similar range of variation for alumina balances, alkali ratios, alkali/calcium ratios, amount of dark mineral constituents, normative feldspars, and trace element distributions. They show remarkably similar degrees of differentiation and tectonic settings (syn-collision and/or post-orogenic).

Geochronologically, the emplacement of the granites in both the batholiths is almost simultaneous. At least, two phases of magmatism can be recognized with 10 to 25 Ma interval. The older phase of granites magmatism (330–300 Ma) produced the G1 and G2 granite which are mesocratic, tin barren, poorly differentiated and deeply eroded. The younger phase of magmatism (290 – 270 Ma) produced leucocratic, tin-bearing, metasomatised, strongly differentiated granites (G3, G4, and G5 granites), which are metasomatised and still uncovered at places. $^{87}Sr/^{86}Sr$ ratio varies in a common range corresponding to their crustal origin in both batholiths.

According to geomorphological, petrographycal and geochemical data of the granites in both batholiths, it is estimated that the magma might have formed at 700 – 900 ^{0}C & 8 kb P conditions and 600 – 700 ^{0}C & 2 – 2.5 kb P condition for their emplacement.

In the second part of the study, geochemical characteristics of the Hercynian tin-bearing leucogranites have been applied to estimate tin prospectivity of Himalayan leucogranites. It has been found that several geological and geochemical features are fully comparable (*texture, color, mineral constituents, tectonic settings, alumina balance, alkali/calcium ratio, ferro-magnesium ratio, dark mineral constituents, Ba, Rb, Sr*, and others). However, there is contrast mainly in parameters, which are controlled by post-magmatic metasomatism (*alkali ratio, and free quartz).*

The leucogranites in Himalayas, while holding the similar petrological feature as the leucogranites in Hercynian Europe, have no record on the tin mineralization. It may indicates that tin mineralization generally associates with the leucogranites but the leucogranite may not always hold tin mineralization. It seems that environment of magma generation (crustal thickness) is critical factor for tin prospectivity of a leugranites, rather than petrological and geochemical compatibility. It can be argued that the leucogranites in Himalayas have formed in very thick crust (60 – 70 km), whereas the leucogranite in Hercynian Europe have generated not more than 40 km thick crust. It may reflect that the source of tin and source of granitic magma may not coincide. It seems for fetch to conceive the school of thought, which believe that the tin is brought to the granitic magma from lower crust or upper mantle. This could be possible in the case of Hercynian orogeny where the crust was relatively thin – but in the Himalayan orogeny seems difficult for the leucogranite to assimilate deeply originated tin bearing fluid phase, as they have generated much higher from the level of lower crust or upper mantle. Hypothesis of tin metallogeny based on the thickness of Earth's crust is also supported by the fact that most of the tin fields of the world are located in crustal thin provinces. Alternatively it can be said that the parental rocks of Himalayan leucogranites were tin free or well refined, metal free undistinguished sediments.

The older Hercynian granites in Europe show significant similarities in chemical and petrographical features with the Almora granites in the Lesser Himalayas (*alumina balance, alkali/calcium ratio, ferro-magnesium ratio, dark mineral constituting elements, free quartz, alkali ratio, trace element distribution, initial Sr isotope ratio, REE distribution*). The source composition of Almora granites is more certain as they have brought up by several parallel upthrusts. The petrological and geochemical compatibility of the Almora granites with the Hercynian older granites favor the pelitic composition of source rock for later granite in Europe.