Cretaceous magmatism and Cu-Au mineralization in the region of the Apuseni – Banat – Timok – Sredno-gorie belt – constrains from U-Pb zircon and Re-Os molybdenite dating

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The Apuseni – Banat – Timok – Srednogorie (ABTS) belt is Europe's most extensive belt of calcalkaline magmatism and Cu-Au mineralisation, related to the subduction of the Tethys ocean beneath the European continent. Economic deposits are restricted to certain segments along the belt, and all major porphyry-style and high-sulfidation ore deposits in Bulgaria are aligned on the Panagyurishte corridor, a narrow zone crossing the ABTS belt obliquely. The aim of this study is to constrain the age of the Cretaceous magmatic rocks (single zircon grain U-Pb), isotope-geochemical characteristics of the magmatites (Hf-Sr-Nd-Pb) and to define the time of the mineralisation (Re-Os molybdenite and U-Pb rutile).

Extensive U-Pb dating of zircons from subvolcanic intrusions and major plutons for magmatic rocks and hydrothermal ore deposits reveals a general younging of magmatism from 92.1 Ma in the north (Elatsite) to 78.54 Ma in the south (Capitan Dimitrievo). Cu-Au deposits are restricted to the northern and central part of the profile (ranging in age from 92.1 to 86.11 Ma), while the southernmost part exposes more deeply eroded mid-crustal plutons devoid of economic mineralisation. Re-Os data for the porphyry deposit Elatsite [1] are in the range of the U-Pb zircon data [3]. New Re-Os Molybdenite data from the porphyry deposit Medet [2] are in the same range as the zircon ages (89.61- 90.36 Ma). The U-Pb rutile age of 85.66 Ma from a late dyke of the Vlaikov Vruh porphyry is identical with the Re-Os molybdenite age for the Cu-Mo mineralization.

The age progression of calcalkaline magmatism from north to south is explained as a consequence of slab retreat during oblique subduction, leading to transtensional block faulting and the preservation of near-surface magmatic-hydrothermal products including economic Cu-Au deposits.

References

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Geochemistry of banded iron formation from Vanivilas Sagar, Karnataka, India

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Most BIF's in southern peninsular region of India are of sedimentary origin. These BIF's were deposited in submarine exhalative environments. The BIF's around Vanivilas basin are constituted of conglomerate, calcareous sediments interbeded with metavolcanic rocks, phyllite and quartzite. The BIF's and associated sequences have been folded along a regional NW-SE axis and the sequences are said to be young towards a general northward direction. The preserved structural features help to constitute the litho-stratigraphy and tectonic history.

BIF's samples from non-manganiferous horizons were analysed. The samples analysed represent bulk samples with four to five bands of magnetite with equal number of intervening bands. These samples were analysed for major, trace and REE to understand the process of deposition. SiO_2/Fe_2O_3 ratio varies from 1.19 to 1.72, which depends on the thickness of micro or meso bands present in the samples. Based on high Low contents of (CaO + MgO) and very high Al_2O_3 and low CaO+MgO can be classified as aluminous iron formation (Dymek and Klein, 1988). The major element data suggest contaminant of terrigenous component during precipitation of these BIFs. Trace element data does not show the contribution of volcano-clastic contribution to the basin in which these BIF were deposited. The REE data normalized with chondrite (Evenson et al, 1978) shows enrichment for HREE and positive anomaly for Eu. The REE data normalized with Archean crust also show enrichment for HREE but no Eu anomaly, suggest that BIF are either related to redox condition of the deep oceans or the mixing of seawater and input of clastic from which iron were derived.

It is universally accepted that BIF's are originated as chemically precipitated sediments. La enrichment, positive Eu anomalies and depletion in total REE for the samples suggest that iron and silica were provided by hydrothermal solution. High content of Al_2O_3, fractionated REE in these BIF's indicate terrigenous contamination. (Co + Ni + Cu) vs total REE in these samples suggest them hydrothermal deposits. The absence of Eu anomalies (normalized with Archean crust) for BIFs is either related to redox condition of the deep oceans or the mixing of seawater and input of clastic from which the iron were derived. In conclusion the iron in the ferrous state brought by hydrothermal solutions precipitated in the form of layers under suitable conditions.

References

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