Geodynamics, geochronology and Cu-Au hydrothermal ore provinces in the Banat region and Apuseni Mountains

Daniela Gallhofer[1], Albrecht von Quadt[1], Ioan Seghedi[2], Irena Peytcheva[3,1], Christoph A. Heinrich[1]

[1]IGP, ETH Zurich, Switzerland, gallhofer@erdw.ethz.ch, quadt@erdw.ethz.ch, heinrich@erdw.ethz.ch
[2]Romanian Academy, Institute of Geodynamics, Bucharest, Romania, seghedi@geodin.ro
[3]Geological institute, BAS, 1113 Sofia, peytcheva@erdw.ethz.ch

Introduction

The magmatic-hydrothermal ABTS (Apuseni-Banat-Timok-Srednogorie) belt in southeastern Europe extends from Bulgaria in the east, through Serbia to Romania in the north, where it terminates in the Banat region and Apuseni mountains. ABTS belt hosts some of Europe's largest porphyry Cu deposits and epithermal Cu-Au deposits. Skarn deposits prevail in the Romanian segment. The deposits are associated with predominantly calcalkaline Late Cretaceous magmatism. In the Apuseni mountains an additional younger phase of mineralization is superimposed on the Late Cretaceous metallogenic history. The younger porphyry-type and epithermal Cu-Au-Te deposits are associated with Miocene calcalkaline magmatism. The Late Cretaceous calcalkaline magmatism in the ABTS belt is related to northward subduction of Neotethys ocean. The superimposed Miocene calcalkaline magmatism and the associated Cu-Au-Te deposits were proposed to be related to extensional melting of metasomatized mantle that was previously enriched, probably during Cretaceous subduction (Harris, 2007; Rosu et al., 2004).

Geochemistry and U-Pb isotope geochronology

In the Banat region holocrystalline equigranular intrusive igneous rocks prevail, subvolcanic igneous rocks with porphyritic textures are more common in southern Banat. The medium- to high-K calcalkaline igneous rocks were classified as Granodiorites, Diorites, Gabbros and Syenodiorites. Chondrite-normalized rare earth element (REE) patterns show a moderate light REE enrichment and flat to slightly concave heavy REE. Some samples additionally show a weak Eu anomaly. The igneous rocks are enriched in large ion lithophile elements (LILE) like Rb, K, Pb, Sr and depleted in high field strength elements (HFSE) like Nb, Ta. Only one sample has an adakite-like trace element signature ($Sr/Y \geq 40$, $Y \leq 18$). U-Pb LA-ICP-MS analyses were performed to date the Late Cretaceous igneous rocks from Banat region. First results indicate a time span of magmatism from 75 to 84 Ma. A sample from the Getic basement gave an age of 318 Ma.

Discussion of the results

The trace element patterns of the Late Cretaceous igneous rocks are typical for magmas generated in a subduction setting. The largely missing adakite-like rocks might explain the rare occurrence of porphyry Cu deposits in the Banat region. Former K-Ar age data show a large scatter (110 Ma to 40 Ma) for the Banat region and Apuseni mountains (Ciobanu et al., 2002). New U-Pb ages narrow down the duration of magmatism in Banat region.

References

Ciobanu, C., N. Cook, and H. Stein, 2002, Regional setting and geochronology of the Late Cretaceous Banatitic Magmatic and Metallogenetic Belt: Mineralium Deposita, v. 37, p. 541-567.

Harris, C., 2007, Pb-isotope microanalysis of fluid inclusions, with applications to the Miocene Au-Cu ore district of the Apuseni Mountains, Romania: PhD thesis, ETH Zurich, Zurich, 196 p.

Rosu, E., I. Seghedi, H. Downes, D. H. M. Alderton, A. Szakacs, Z. Pecskay, C. Panaiotu, C. E. Panaiotu, and L. Nedelcu, 2004, Extension-related Miocene calc-alkaline magmatism in the Apuseni Mountains, Romania: Origin of magmas: Schweizerische Mineralogische Und Petrographische Mitteilungen, v. 84, p. 153-172.