The Certej hydrothermal ore deposit (Apuseni Mts., Romania): fluid inclusions, types and age of the related hydrothermal alteration

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An important low sulphidation type epithermal Au deposit occurs at Certej in the southeastern part of the Apuseni Mts., Romania in a small Neogene intramountain basin (Brad-Săcărâmb).

The ore bodies are hosted in Miocene amphibole andesite and Cretaceous and Neogene sandstone, micro-conglomerate and black claystone as well as in their brecciated counterparts. K-Ar ages for the magmatic rocks in the region are between 12.58 – 10.27 Ma. The characteristic mineral association of the studied ore deposit is pyrite, sphalerite, galena, chalcopyrite, tetraedrite-tennantite series minerals, bournonite, arsenopyrite, boulangerite, pyrrhotite and mackinawite accompanied by quartz, calcite and barite. Two ore-forming stages have been distinguished based on $^{204}Pb/^{206}Pb$ isotope data: 1) syngenetic disseminated Pb-Zn ore in Cretaceous sedimentary rocks, and 2) the main breccia pipe hosted gold-polymetallic ore bodies formed during the Neogene volcanic activity. Hydrothermal alteration products were analyzed by optical microscopy, while selected hydrothermal minerals were determined using XRPD.

Pyritization, silicification, adularization, carbonatization and sericitization are the prevailing hydrothermal alteration types in relation to the main mineralization stage. The XRD study revealed the presence of the following hydrothermal phase minerals: illite, smectite, kaolinite, adularia, barite. Based on K-Ar dating of illite and adularia, the hydrothermal alteration in the Certej occurred between 11.86 (+/-0.52) and 12.29 (+/-1.56) Ma, within the time interval of magmatic activity.

Primary and secondary fluid inclusions in quartz and sphalerite were trapped from a heterogeneous (boiling) fluid. Homogenization temperatures range between 186 – 355.4°C, however, due to the occurrence of heterogeneous entrapment, the temperature of ore forming processes is most probably around 180 – 200°C. The determined eutectic temperatures of the fluid inclusion brines range between -19.3 – -24.4 °C, while freezing point depressions from -4.1 to -0.1°C. The final melting temperature mostly occur between -0.2 and -3.3°C and thus fluid inclusion salinities are in the range 0.35–5.41 eq. wt. % NaCl.

Depth zones of the Dead Sea rift as a possible source of hydrocarbons

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Interest to deep sources of hydrocarbons has appeared after the finding of oil/gas fields in magmatic rocks. For research of oil/gas bearing deep layers, the Polycyclic Aromatic Hydrocarbons (PAH) in basalt rocks of Dead Sea Rift have been studied. The samples were selected both to the north and south from Kinneret Lake in a few ten kilometers distance from

it of separate batholiths intruded in sedimentary stratums. There were analyzed non-altered basalts, altered basalts, tuffs. Identification of the PAH have been carried out in Biosphere's Carbonaceous substances Laboratory of Lomonosov Moscow State University (Russia) by "spectroscopy of E. Shpolsky" using a "Fluorat-Panorama" spectrofluorometer (LUMEX, Russia).

GOLAN HEIGHTS.

There are 16 associations of PAH. 4 associations form 51, 5% all samples. Most spread associations are: 1) Naphthalene/ Phenanthrene / Pyren (SUM of PAH from 28,3 to 117,5 ng/g, Naphthalene from 51,2 to 80,9%).Presents in Basalts and Tuffs. Locate in West, Center, South /West and South of North Batholith. 2) Phenanthrene/ Naphthalene/, Pyren. (SUM of PAH from 52, 6 to124, 5 ng/g, Phenanthrene from 47 to 60, 2 %). Presents in Basalts. Locate in West, Center, South /West and South of North Batholith. 3) Naphthalene/Phenanthrene/ Benzo(ghi)perylene (SUM of PAH from 53,3to87,5 ng/g, Benzo(ghi)perylene from 1,9 to10,5 %). Presents in Basalts. Locate in West and South/West of North Batholith. 4) Naphthalene/ Pyren/ Chrysene (SUM of PAH from 81, 1 to 95, 5 ng/g, Chrysene from 0, 25 to 0, 52, Pyren from 4, 6 to 57, 3). Presents in Basalts. Locate in the Center of North Batholith. All 4 associations belong to higher temperature formations (Naphthalene and Phenanthrene). And Pyren and Benzo (ghi) perylene belong to lower temperature formations. In the same time existence such components as Phenanthrene, Chrysene, and Pyrene probably pointed on migrations of Hydrocarbons from depth.

BASALT WEST.

There are 8 associations. 3 associations form 70% all samples. Most spread associations are: 1) Naphthalene/ Phenanthrene/ Pyren. Presents in Basalts. Locate in: West of North Batholith; West of South Batholith; West of separate dyke. 2) Naphthalene/ Phenanthrene. Presents in Basalts. Locate in: West of North Batholith ; West and South of South Batholith ; West of Separated dyke. 3) Naphthalene/ Pyren. Presents in Basalts and Tuffs. Locate in: West of North Batholith ; West of South Batholith ; in West of separated dyke.

All 3 associations belong to higher temperature formations (Naphthalene and Phenanthrene). And Pyren and Benzo (ghi) perylene belong to lower temperature formations. In some samples Phenanthrene, Chrysene, Pyrene was identified.

Presence of diverse groups of PAH in the rocks of highly fractured and secondary basalts alterated, point at migrations of Hydrocarbons through faults from possible deep reservoirs/source of Dead Sea Rifts.

Upper Triassic (Norian) sedimentary evolution of the Slovenian Basin (eastern Southern Alps, W Slovenia)

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The Slovenian Basin represents a Mesozoic deep-water sedimentary environment, located on the south Tethyan passive continental margin. Its history can be divided into two parts: from the initial opening during late Anisian/Ladinian to progressive shallowing in the Carnian, and from a marked deepening, which started in late Triassic/early Jurassic, to the final closure at the end of Cretaceous. Upper Triassic deposits comprise Carnian "Amphiclina beds", followed by Norian-Rhaetian "Bača Dolomite", which in the northernmost part of the basin laterally passes into non-dolomitized Slatnik Formation.

The "Bača Dolomite" due to strong late-diagenetic dolomitization represents a very poorly investigated segment in the history of the Slovenian Basin. In order to resolve its depositional characteristics, an incompletely dolomitized succession outcroping on Mt. Slatnik (south-eastern Julian Alps, W Slovenia) has been studied in details. The Mt. Slatnik section structurally belongs to the Tolmin Nappe, which is a part of easternmost Southern Alps. The Norian age of the "Bača Dolomite" in this section has been established on the basis of superposition, foraminifers and conodont data.