GEOLOGICAL, GEOCHEMICAL AND GEOPHYSICAL RESEARCH
CONTRIBUTIONS TO OUTLINING BASE METAL MINERALIZATION IN
DEALUL MARE - PODELE STRUCTURE (METALIFERI MOUNTAINS)

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The integrated interpretation of the complex prospects results (1980-1995 Prospectiuni S.A.) emphasised new geological, structural and metallogenetic aspects in the Dealul Mare - Podele zone, located in SW of the Metaliferi Mountains.

The island-arc rocks (Upper Jurassic - Lower Cretaceous) form the geological composition of the location, while sedimentary rocks (Upper Jurassic - Lower Cretaceous), Neogene and Quaternary are subordinated.

Within the island are Mesozoic igneous rocks two complexes have been separated: basic and intermediate acid, represented by an alternance of basic and andesite lava with the respective pyroclastics. These rocks are arranged in an E-W syncline, slightly tilted toward the north. The relation between the two complexes is a discordant and tectonic one, the last being along two major E-W fractures (the inverse fracture Valea Mare-Podele and the southern fracture Razleu Valley - Cucui Brook).

The two rock complexes are pierced by Eocretaceous igneous rocks (granite, tonallite, granodiorite and diorite), displayed along two alignments: North: Valea Mare - Podele, and South: Cucui Brook - Valea Oanei.

This structural pattern is very well represented by the complex geophysical image. Thus, the gravity maximum and the magnetic minimum overlapped the Eocretaceous intrusive rocks, suggesting their evolution in depth (gravity maximum), the hydrothermal process expansion and development (magnetic minimum, radiometric and maximum). The same data indicate for the Eocretaceous body in Valea Mare an approximately vertical southern flank with slight southward tilting and a northern flank, northward tilted.

In the area two mineralization types appear: syngenetical (manganese and pyrite + calcopyrite), without economic importance; epigenetic, of hydrometasomatic and hydrothermal type, which formed accumulations of economic interest and were generated by Eocretaceous magmatite. Within the last mineralization type, a hydrometasomatic mineralization (with pyrometasomatic beginning) was separated, developed in Valea Mare sector, that formed porphyry-copper mineralizations +/- Mo and continued with a hydrothermal phase that generated a copper +/- Mo and gold-base metal mineralization, developed in the Valea Mare basin - Zapozi Brook - Cucui Brook.

The complex research data indicate the overlap of the syngenetetic mineralization location with the epigenetic ones, within the (Vorta - Dealul Mare - Valisoara) metallogenic alignment. Within Dealul Mare - Valisoara area two sub-alignments are individualised: northern, Valea Mare and southern, Zapozi Brook - Cucui Brook. The mineralizations concentration was made along some prevailing directions: NE-SW, NW-SE, N-S and is associated with a breccia formation.

The same data also indicate a block structure of the location that can be followed from north to south and east to west. There was ascertained that the eastern compartment - springs-Cucui Brook is the best preserved, in comparison with the ones in the south-west.
The research data obtained allowed us an acquisition of the sectors from their economic prospects point of view: 1. Cucui Brook - springs sector; 2. Trecatorii-Zmeului Brook; 3. Stânii Brook sector; 4. Valea Mare sector; 5. Valisoara sector.

The sector with the maximum metallogenetic potential is springs-Cucui Brook one, where, through drilling (1,2,10,25,26,27,28) and mining (outcropping, wells, Speranta gallery) workings a vein mineralization was identified (5 veins: 1,2,3,4,5), of stockwork and impregnation, in which the contents vary, as follows: 0.5-16.62% Pb, 0.5-24% Zn, 0.1-6 g/t Au. The mineral parageneses identified in veins: galena, blende (clephanical), calcopyrite, pyrite, tetraedite, marcasite, native gold; gangue: calcite, quartz and clay minerals).

The veins have a NW-SE/60-80 NE trending and were investigated on a length of 300 meters, and on the vertical on 345 meters. The electrometrical, radiometric, geochemical and geological data indicate the possibility of the veins continuation toward NW and SE on about 500 meters.

The metallic elements associations established by geochemical data processing: Pb, Zn, Cu, Ag, Ni, Sb, Ni/Co = 8, at the upper part and the geochemical association Pb, Zn, Cu, Ag, Cd, Sb, Bi, Mo, Ni/Co = 2 at the lower part of the drillings, at which the anomalies image of Pb, Zn, Cu, Ag, Cd can be added, show that the drillings intercepted the upper part of a hydrothermal vein mineralization, generated by Eocretaceous magmatite, overlain by the syngenetic mineralization pointed out.

The investigation of other sectors mineralizations (including springs- Cucui Brook sector) was stopped for the moment.

Each investigation method has its opportunity in the identification and outlining of the mineralizations at Dealul Mare - Podari.

**NEOGENE GOLD MINERALIZATION IN ROMANIA**

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The Neogene gold mineralizations from Romania are pretty well known as an important mining resource for gold extraction. They are of interest to the mineralogical community because of the various assemblages and of the famous free gold hand specimens. Information on gold mineralization is presented by detailed studies or synthesis papers.

**Types of gold mineralizations**
The Neogene gold mineralizations may be divided according to different characteristics: mineralization form, gold/sulfide ratios, Ag/Au ratios, characteristic associations of elements, nature of host rocks and composition of associated volcanics. These mineralizations of Sarmatian-Pannonian age may be classified into two main groups including gold mineralizations in which gold is the main component and gold-bearing sulfide mineralizations where gold is a by-product (Table 1).
According to gold/sulfide ratios two types of gold mineralization can be defined: sulfide-rich gold mineralizations as Muncaceasca, Hanes, Valea Morii, Cavnic, Iiba, Nistru, Herja; sulfide-poor gold mineralizations as Musariu, Rosia Montana, Sasar, Valea Rosie, Caraciu.

The Neogene gold mineralizations are connected to shallow intrusions (andesites, quartz andesites, dacies, porphyry micromonzodiorite, porphyry microdiorite, porphyry microgranodiorite) and are mainly hosted by Sarmatian-Pannonian volcanics; less are hosted by sedimentary rocks.

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**Mode of gold occurrence**

The investigations of the gold mineralization point out the following gold occurrences: free gold, gold grains included in various minerals and invisible gold supposed in the lattice of the As-minerals.

Free gold is significant in the gold-rich deposits, at their upper levels. It appears as crystals, in some mineralizations forming dendrites, plates, lamellae, filaments, etc., in places up
to 5 cm long; free gold has been recognized in intergranular spaces and cavities. This type of gold with different morphologies has been sampled from Rosia Montana, Musarui, Ruda Barza, Valea Morii, Caraciu, Baita Craciunesti, Hondol, Dealul Neagra from the Southern Apuseni Mts. or Dealul Crucii, Valea Rosie and Valea Borcutului in the Guta Mts. The free gold occurrences are very rare in the gold-bearing base metal mineralizations. The gold grains are included in pyrite, chalcopyrite, sphalerite, galena, arsenopyrite, löllingite, bornite, tetrahedrite, alabandite, quartz, carbonates and even in native arsenic with crustiform textures. The association of native gold with quartz, sulfides, sulfosalts and tellurides is very characteristic. An affinity of the native gold for bismuth minerals in the copper sequences from Nistru has been pointed out (Damian, 1998). The microscopic investigations show different sizes for gold grains (< 1 μm - 0.2 mm). The invisible gold may be fixed in the lattice of the arsenian pyrite, arsenopyrite and löllingite or fixed by absorption onto the sulfides surface during the crystal growth.

**Some chemical data**

*Ag content.* The Ag content in the gold grains points out a large variation from 2.7 to 93.16 atomic % (74 analyses) and of course the Ag/Au ratios display the same range of variation (0.032 – 14.009). The lowest Ag content (2.724 – 6.759 atomic %) is recognized in the gold grains from porphyry copper deposits and the Ag/Au ratio varies from 0.032 to 0.083 (3 analyses). Opposite, the highest Ag content (90.62 – 93.16 atomic %) is shown by the gold grains from base metal mineralizations from Suior and the Ag/Au ratio is 9.661 to 14.009 (8 analyses). Generally, the silver content in the Sarmatian and Pannonian gold mineralizations varies widely (9.5 – 61.76 atomic %) and the Ag/Au ratio is between 0.105 and 1.619; frequently the values include 20 – 40 atomic % (45 analyses). The Ag content of the gold grains from gold-bearing base-metal mineralizations from Herja and Cavnic varies between 36.28 and 53.74 (16 analyses) and of the gold grains with an affinity for bismuth minerals from Cu veins (Nistru) indicates 24.82 atomic % Ag (Damian, 1998).

*Compositional zoning in gold grains.* This particularity has been investigated for the gold grains from Au-Ag mineralizations from Sasar and for the gold grains from gold-bearing base metal mineralizations from Suior. An increase of Ag content from the core (43.20 atomic % at Sasar; 91.5 atomic % at Suior) toward the rim (48.72 – 61.76 atomic % at Sasar; 92.58 atomic % at Suior) is recorded.

*Gold fineness.* There is a large variation of the gold fineness from 983 to 122 %. The highest fineness is generally characteristic of the gold grains from the porphyry system (983 – 957 %) and for some Au and telluride deposits (986 – 900 %) as Breaza, Rosia Montana, Sacaramb, Fata Baii and Stanija.

A particular feature is shown by the gold in the Rosia Montana and Suior deposits. Both deposits contain Ag-sulfosalts; the Suior deposit has the highest Ag content. We determined the gold fineness from Rosia Montana 952 – 840 %. Certain data from the literature show 500 %. There is the possibility of two generations of gold at Rosia Montana. The latter could be paragenetically associated to Ag-sulfosalts explaining the low value (500 %) of gold fineness. Two gold generations have been recognized at Sasar (Petruilian et al., 1961). It is possible that the two values might represent both generations.
Conclusions

The Neogene gold mineralizations are genetically related to subvolcanic intrusions of intermediate composition. They are mainly hosted by Sarmatian and Pannonian volcanics; always these intrusions are younger than the extrusive activity which generated the volcanic structures. Less gold mineralizations are located in areas composed of sedimentary rocks.

In the various types of gold mineralizations gold is present as free gold, gold grains as inclusions and invisible gold; sometimes in the same ore deposit all the three types of gold occurrences have been found (e.g. Baia de Arieș in the Apuseni Mts.).

Concerning the invisible gold, our data point out a significant correlation between Au and As in arsenian pyrite and arsenopyrite from different types of gold mineralizations. Available evidence suggests that these sulfides (arsenian pyrite, arsenopyrite) are a very important host for the invisible gold. Presently available information does not allow to specify the species of gold and the position of gold in these sulfides.

The compositional variation of the gold grains displays the following features: a) the gold grains from the porphyry systems and some epithermal gold and telluride mineralizations have the lowest Ag content and therefore the highest fineness; b) the gold grains from some gold-bearing base metal mineralizations (e.g. Suior deposit) have the highest Ag content and therefore the lowest fineness; c) a large spectrum of Ag contents is known between these two categories. In fact, the Ag content varies also in the same gold grain; the Ag content increases from the core towards the grain rim.

Selected references


GEOLOGICAL AND ENVIRONMENTAL IMPACT ASPECTS OF MINING WASTES IN THE BAIA MARE REGION

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Hydrothermal activity in Baia Mare metallogenetic area occurs along some major tectonic E-W alignments between Ilba and Baiut. On the basis of their metallogenetic particularities, three districts have been recognized: (1) Ilba- Baita, (2) Sasar-Valea Rosie and (3) Dealul Crucii-Baiut (Borecos and Vlad, 1994).
Ore deposits in the Baia Mare region are of low sulphidation epithermal type related to volcanic and sedimentary rocks.

Over the entire Baia Mare region Borcos and Vlad, (1994) have identified five paragenetic mineralization sequences: (1) Fe-W; (2) Cu-Bi; (3) Pb-Zn-Cu; (4) Sb; (5) As-Au-Ag.

The metallogenetic activities have been generated in three stages associated to the second magmatic activities, associated to the Sarmatian, Pannonian and Pontian age.

The first stage is of Pb+Zn+Cu > Au, Ag type related to the Sarmatian andesitic structures in Ilba – Baita district.

The second stage is characterized by an accentuated gold-silver tendency (sulphocalisits; local concentrations of Pb and Zn, Au+Ag >> Pb+Zn) related to the Pannonian quartz andesite bodies. The third metallogenetical stage has a poly metallic character containing frequently copper sequences Pb-Zn and locally rich concentrations of Au, Ag and sulphosalts (Pb+Zn+Cu > Au+Ag+Sb).

This metallogenesis is developed in various structural settings of the central – eastern parts of the metallogenetic zone of the Gutai Mountains related to the sedimentary and volcanic (pyroxene andesites, Pontian age) rocks.

The geochemical signature is characterized by the presence of major elements, such as: Pb, Zn, Cu, Au, Ag, S and trace elements, such as: As, Cd, Co, Bi, Mn, Sb, Fe, W, Tl, Te, Ni, Ga, In.

The mineralogical composition in the entire Baia Mare zone is characterized by sulphur and sulphasalts minerals, such as: hematite, magnetite, wolframite, scheeleite, pyrite, marcasite, arsenopyrite, tetrahedrite, tennantite, bismuthinite, chalcopyrite, sphalerite, galenite, bournonite, smesite, jamesonite, boulangierite, antimonite. Native As, realgar, orpiment minerals, electrum, Au, Ag native, miargyrite, proustite-pyrargirite, pearsseite-polybasite, included in gangue, such as: quartz, adularia, calcite, rhodocrosite, barite.

The alteration phenomena are characteristic of the low sulphidation type, zonally distributed around the ore, such as: propylization, chloritization, adularization, illitization, argillization and local carbonization and silification.

As a consequence of the mining activity two types of mining wastes result: spoil wastes characterized by a small content of metal elements a coarse granulometry and by dryness; and tailing wastes characterized by important contents of metal, they have a small homogeneous granulometry and they are moist (wet).

Under some circumstances the mining wastes can turn into urban ore deposits (Keller, 1992). Materials (especially metals) that end up in landfill and other waste management facilities are sometimes designated as urban ore because of the useful materials the waste may contain.

The concept of “urban ore” was released when it was discovered that ash from the incineration of sewage sludge in Palo Alto, California, contained large concentrations of gold (30 ppm), silver (660 ppm), copper (8000 ppm) and phosphorus (6,6 %). Each metric ton of the ash contains approximately 1 ounce of gold and 20 ounces of silver (Keller, 1992). The gold is concentrated above natural abundance by a factor of 7500, making the “deposits” double the average grade that is mined of 9400, similar to that of a common ore grade. Commercial phosphorous deposits vary from 2 to 16 %, sots ash with 6,6 % P has the potential of a high value resource. The ash in the Palo Alto dump represents a silver and gold deposit with a value of about $10 million, and gold and silver worth approximately $2 million are being concentrated and delivered each year.
In Baia Mare region there are two major types of mining waste: (1) spoil waste and (2) tailing waste.

(1) The spoil waste inventory shows a number of hundred occurrences. The surface of the spoil waste varies from 0.01 ha (Baiut Vest, +812 m) to 2.7 ha (12 Cisma, +686 m). The volume of the spoil waste deposition varies from 870 m³ (Tigher, +356 m) to 97660 m³ (Purcari, +405 m). Ten of the hundred spoil wastes are active (in exploitation) and ninety are inactive. The chemical composition of the major elements is, as follows: Pb varies from 0.02% to 3.2% (Borcut spoil, +925 m and Varatec spoil, +1044 m); Zn varies from 0.01% to 1.85% (Borcut spoil, +925 m and Varatec spoil, +1044 m); and Cu varies from 0.01% to 1.01% (Gheroldy spoil, +455 m).

(2) There are twenty tailing wastes; their surface varies from 1.5 ha to 120 ha (Bozanta tailing); they represent 433.3 ha of the total surface. The quantity of the material deposition varies from 0.151 million tons to 40.968 million tons (Bozanta tailing), having a total value of 112,926 million tons. Six tailings are in exploitation and fourteen are in conservation. After their mode of construction, there are seven tailings of field type, four of valley type and nine of coastal type.

The urban ore from Baia Mare region is Meda tailing. It has a surface of exploitation of about 16 ha with a quantity of deposition of 4.4 millions tons. The mineralogical composition is given by the presence of quartz, adularia, pyrite, sphalerite, galenite and submicroscopic gold (amount 0.6 g/t). The chemical composition of the Meda tailing is: Au – 0.8 – 1.05 g/t; Ag 13 – 21 g/t; Pb 0.05 – 0.114%; Zn 0.109 – 0.174%; Cu 0.021 – 0.035%; S 1.58 – 2.35%; SiO₂ 58 – 65%; Al₂O₃ 5.91 – 11.147%. Its moisture is 13.1% and the dimension of its particles is 70 – 280 micron.

The impact of these mining wastes upon the environment manifests itself the action of water, air and soil. The causes of the impact are, as follows:

1. The rains that washed mining waste acidification themselves and transport the metal in suspension or solution up to groundwaters.

2. The water of the tailing wastes has a chemical composition that is more complex (miscellaneous chemical substances used in mineral processing) that can trickle in groundwaters transporting heavy metals. On the other hand, their physical stability is characterized by the presence of fine dust particles, that after drying rise in the air under the influence or sometime the presence of some favourable conditions that lead to the crackling dam of protection.

The remediation (Bennett and Doyle, 1997) strategy supposes, in function of the mining waste, the following: for the spoil wastes – the material used aims at five goals: as landfill in the engineering project; as aggregate materials; as inert landfill; as landfill for the mine and quarry; as reshape and revegetation.

The problem of the environment toxicity with heavy metals requires a different approach before the environment remediation. The first approach is the adjustment approach. The second approach is the improvement approach and the last approach is the agricultural and forest approach.

The adjustment approach assumes a selection of the vegetal species that adjust to the toxic environment with heavy metals. The improvement approach assumes the neutralization by means of chemical substances of the mining wastes. The agricultural and forest approach assumes the covering with soil for agricultural and forestation utilization (indicated for the Fe and Al mining wastes).
THE STUDY OF ANOMALOUS SOURCES FROM MAGURICII DISTRICT, MEZES MTS (NW-APUSENI MTS, ROMANIA)

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This paper presents the main results of our research in the south slope of the Mezes Mts, between Maguricii Valley and Corbului Valley, aiming to identify Au-Ag and base-metal ore deposits. At first the research has consisted in electric prospecting, using I.P. and resistivity methods, next detailed measurements have been performed on the interesting zones, using Vertical Electric Soundings. Finally, we have set up a physical model, in the laboratory. That has helped us to find out the anomalous sources and their most probable depth and dip. It also made us to eliminate the relief effect.

From the geological and tectonical points of view, the southern part of Mezes Mountains corresponds to a horst structure. It is constituted of the formations belonging to the mesometamorphic Somes series. This series was created through the metamorphic process (almandine-amphibolite facies) of terigene deposits, clay-sandstone with fine bands of shales, clay-schists, acid lavas and tuffs, rarely basic. Micaschists (+/- amphiboles, +/-garnets) which alternate with paragneiss (+ muscovite, biotite and garnets) are the most widespread. There are many petrographic types, characterized by the presence of the dominant mineral. Quartz schists with muscovite and chlorite (+/- biotite +/- amphiboles), amphibolites and amphibole schists can be noticed.

Leucocratic gneisses exist, too. These have been formed, most probably, through metamorphism of lavas and acid tuffs. Locally, at the contact zone of the eruptive rocks and country rocks (micaschists, paragneis) migmatic rocks occur. These rocks were initially meso-metamorphic crystalline schists, affected by a weaker metamorphic process.

All this geological assemblage is pierced by several small eruptive dykes and apophyses. These have been emplaced during the Paleocene. The mineralogical composition and the relations with the country rocks show that these rocks belong to the banatitic type.

The banatite magmatism is calc-alkaline and consists of two cycles: the first one, represented by pyroclastics, andesite lavas and subvolcanic bodies, andesite sills and dykes, dacites and rhyolites, and the second one, by granites, diorites and granodiorite bodies.

In the fractured zones, the eruptive rocks are often strongly cataclasized and hydrothermalised (silicified, calcitied, chloritized, pyritized).

Two fracture systems have been identified in the area. The main one has a NE-SW trend and is almost vertical (70 - 80° W). The second one crosses the former and is responsible for the splitting of the crystalline.
For electric prospecting a longitudinal gradient with the following features has been used:
AB = 1200 m, MN = 40 m, step = 20 m. The measured profiles were located at 100 m each other.

An I.P. maximum with a range of 30 - 50 mV/V in the three apexes, a NNE - SSW trending, and dimensions of almost 1200 x 150 m has been outlined between the Corbului Valley and Maguricii Valley. The background values have a range of 10-20 mV/V. The maximum I.P. with the same orientation is associated with a relative resistivity maximum (500 - 1000 Ωm).

The I.P. maximum has been investigated with a vertical electric soundings line. The geoelectric section has shown a possible mineralized fracture in the depth.

In the Corbului Valley, the main known mineralizations have been seen nearby an eruptive body, on a fracture zone. The mineralizations consist of disseminated pyrite in quartz schists. A rich level having an aspect of massive ore has been identified inside the schists. This band has 4 cm width; it is oriented to the N-S and is crossed by an E-W fracture. The rock samples taken from this outcrop have a 90 mV/V maximal I.P. value.

On the Maguricii Valley, the mineralizations occur like weak impregnations, especially as pyrite, inside some quartz schists with amphiboles.

The assay results show interesting contents of Au, Ag, Cu, Pb, Zn.

In order to identify more exactly the anomalous sources, a model has been performed in the laboratory (sc. 1:2000). Using this model, the relief effect could be eliminated. This correction allowed the rigorous localization of the anomalous sources.

Comparing I.P. maps and the I.P. cross-sections, issued from the model of sources and those issued from the survey, the accurate depth and dip have been obtained.

A vein hydrothermal mineralized system was interpreted based on geological and geophysical data.

References

THE MINERALISED STRUCTURES IN THE BAIA MARE ORE DISTRICT

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1. Introduction
The Baia Mare metallogenetic district is situated in the Gutăi Mountains and its represents the NW part of the Neogene Volcanic Chain inside the Carpathians. The calc-alkaline Neogene volcanism is related to the subduction processes of the Orogenic Carpathian Chain. This district is the most productive and it includes gold and base-metal mineralisations.

2. Geological setting
The prevolcanic basement is made up of metamorphic rocks and Paleogene and Neogene sedimentary rocks. These formations were deeply dislocated by longitudinal pre-Neogene fault (Cărlibaba-Carei) that controlled the development of the volcanism and of the metallogensis
(Borcos et al. 1994). After the geochemical features of the Oaş-Gutâi Mountains volcanism, two types of volcanic rocks are observed: calc-alkaline acid and calc-alkaline intermediate. The volcanic activity began with the explosive acid phase (rhyolite-rhodacite) of Lower-Badenian-Sarmatian age. The intermediate volcanism occurred in the second (Sarmatian-Pontian) and third cycle (Upper Pliocene) (Giuşcă et al., 1973). The recent K-Ar data (Edelstein et al., 1992; Kovacs et al., 1994; Pécsay et al., 1994) indicate a Late Badenian to Pannonian age for the Oaş-Gutâi Mountains. The intrusive magmatic activity occurred later together with the lava flows of the calc-alkaline intermediate volcanism. The bodies of the intrusive magmatic rocks from the Oaş-Gutâi Mountains have different morphological characters: stocks, dykes, apophyses, sills, microlacolites. These intrusive bodies play an important role in localising the ore deposit.

3. Metallogenetic Background

The metallogenetic activity corresponds to three distinct phases (Giuşcă et al., 1973) overlapping the calc-alkaline intermediate magmatic activity of the second eruption cycle. According to the K-Ar and Ar-Ar radiometric data (Lang et al., 1994) the metallogenetic activity is restricted to the Pannonian level (11.5-7.9 M.a.). Analyzing this data we consider that there is a single metallogenetic phase in Oaş and Gutâi Mountains. Within this metallogenetic phase, three mineralisation stages can be separated: a copper one, a base-metal one and a gold-silver one. The upper parts of the copper and base-metal mineralisations have important quantities of gold and silver. Within the base-metal mineralisations have important quantities of gold and silver.

4. Types of Mineralized Structures

The veins appear in the form of vein systems associated with intrusive or stratovolcanic structures. The gold-silver veins are localized in stratovolcanic structures. In such structures base-metal mineralisations also appear, but they are rich in gold and silver. The most typical stratovolcanic structure occurs at the gold mineralisations at Sâsar-Propad. The main veins are very extended on the vertical and pierce the entire stratovolcanic structure. At Văratec Băiuţ, in the eastern part of the district, the vein mineralisations appear in a stratovolcanic structure. The gold base-metal veins are localized in intrusive bodies, lava flows, pyroclastics and Paleocene sedimentary rocks. The central area includes gold-copper mineralisations, and the marginal areas gold base-metal mineralisations. The vein systems associated with intrusive structures are very frequent in the Baia Mare area. Baia Sprie ore deposit is the most representative. The andesitic dyke constitutes the local geological element with an important role in metallogeny. The Main veins is localized on the northern contact and the New vein at the southern contact of the dyke. The Main vein has a large number of branches at the upper and lower part. Inside the dyke small-size veins are known. The vertical zonality is very clear: silver-gold, lead-zinc and copper.

A similar structure is the one at Šuior (Borcos et al., 1973), where the Cremenea vein is situated on the northern contact of the porphyry monzonodiorite structure. Vein systems associated with intrusive bodies are also to be found in the western part of the Nistru Valley. In this area the veins are zonally disposed around a porphyry microlacolite intrusion. On the flanks of the body copper veins appear and towards the exterior veins with base-metal and gold mineralisations are to be found. There are transitions from structures of stratovolcanic type to the ones of
intrusive bodies, where the lower parts, predominantly cupriferous, are localized within subvolcanic structures. Typical of this model is the Bolduţ-Cavnic vein field. A structure associated with an intrusion of laccolite type can be found at Ghezuri-Turţ in the Oaş Mountains. The mineralisation is localized on the flanks of a laccolite with intense potassium altered porphyry microdiorites and has a base-metal character. The copper veins are entirely localized in intrusive bodies of quartz-dioritic type in the east of the mining district at Toroioaga or they are disposed in the spreading area of the microdioritic intrusive bodies like the ones at Cisma–Poiana Botizei. The vein systems with base-metal mineralisations are almost entirely situated in intrusive bodies (Herja).

The stockworks are less known in the Baia Mare area. The reorientation of the prospecting and exploration research in the upper parts of the mineralized structures have emphasized their presence in various areas. In the upper parts of the intensely branched veins predominantly gold stockworks could appear. The most typical body of stockwork type is the one at Borzaş which is followed by a vein system and localized in adularized and brecciated quartz andesites. A similar body localized in adularized pyroxene andesite can be found in the western part of the perimeter, at Racsa. Gold stockworks are localized in the upper branched parts of the mineralized structures at Šuior, Baia Sprie and Aurum-Săsar.

The breccia bodies are the least known in the Baia Mare mining district. The main explosion breccia pipe structure at Kelemen Băiuţ is base-metal mineralized. The dyke type breccias are typical of the mineralized shear fault like the very thick veins at Šuior and Baia Sprie. Inside the very thick veins and at the vein intersections mineralized breccia of phreatomagmatic explosion appears. The breccia especially from the upper parts of the mineralized structures will be known much better from the ongoing prospecting and exploration for gold epithermal mineralisations carried out in the Baia Mare area.

References


