Source of fluorine and petrogenesis of the Rio Grande Rift type barite-fluorite-galena deposits

F. PARTEY1, S. LEV2, R. CASEY3, E. WIDOM1, V. LUETH1 and J. RAKOVAN1

1Dept. of Geology Miami University, Oxford Ohio, 45056, U.S.A. (rakovajf@muohio.edu)
2New Mexico Bureau of Mines and mineral Resources, Socorro, NM, 87808, U.S.A.
3Dept. of Physics, Astronomy, and Geosciences, Towson University, Towson MD, 21252, U.S.A.
(slev@towson.edu)

Abundant fluorite mineralization in the Rio Grande Rift (RGR) barite-fluorite-galena deposits is anomalous compared to typical Mississippi valley type deposits. The source of fluorine in these deposits is controversial. We have tested two hypothesized sources for the origin of fluorine in the RGR deposits. These include release of gaseous HF from magmas associated with rifting, and the leaching of fluorine from Proterozoic basement granites that underlie the Pennsylvanian limestones, which host much of the fluorite mineralization in the region.

In this study chlorine isotopes and Br/Cl were measured from fluorite fluid inclusions. Chlorine and fluorine exhibit chemically similar behavior, and therefore are likely to be derived from the same source if chlorine is associated with rift related magmatism. Sr and Nd isotopes were measured from fluorites, granites, carbonates, and asthenospheric basalts to aid in understanding the petrogenesis of RGR deposits.

Sr and Nd isotopic ratios from fluorites are distinctly more radiogenic than local basalts and Pennsylvanian limestones but similar to the Proterozoic granites. The radiogenic character of the fluorites indicates that the Sr and Nd were derived largely from a granitic source with some influence from a asthenospheric source. 

δ37Cl values from fluorite fluid inclusions range from ~0.003‰ to +3.069‰ relative to SMOC, and the Br/Cl ratio for all the fluorite samples ranges between 0.00008 and 0.00050, except for San Diego Mountain which has a relatively high Br/Cl ratio of 0.00242. There is a strong positive correlation between δ37Cl and Br/Cl in the fluorite data that indicates mixing of Cl from an asthenospheric magmatic and evaporite sources. The calculated range of Cl derived from an asthenospheric source for the Mex-Tex deposit is 40% to 49%. Similarly, between 35% and 13% of the Cl in the Sunshine deposit is asthenospheric in origin. Since F and Cl likely exhibit similar chemical behavior in this system, the presence of asthenospheric Cl is consistent with an asthenospheric magmatic source of F in the RGR deposits.

Geochemical evidences for origin of metallogenic materials in the Maoping Pb-Zn deposit, Zhaotong, Yunnan, China

ZOU HAI-JUN1, HAN RUN-SHENG1 AND FANG WEI-XUAN2

1Kunming University of Science and Technology, Kunming, P.R. China, 650093 (zouhaijunmlmq@yahoo.com.cn, hrs331@sohu.com)
2Geological Survey Center for Non-ferrous Mineral Resources, Beijing, P.R. China, 100012. (fangweixuan@163.net)

The Maoping deposit is typical of the Carbonate-hosted Zn-Pb deposits in northeastern Yunnan. The spatial distribution of ore bodies are controlled by the NE-extending interstratified fault zones. The deposit includes three ore-bodies that respectively occur in three strata, which are the Zaige Formation (Dz1zg), the Baizuo Formation (C1b), and the Weining Formation (C2w). The wall rocks are mostly rough crystal dolomite. Based on the geological features of the deposit, 40 tectonite samples from level 910 and 34 samples from level 846 have been collected, with thirty-four elements tested by ICP-MS method. For level 910, five principal factors can be yielded: F1 (Th, Ta, Ti, Nb, Hf, Zr, ∑REE, Cr, Sc, U), F2 (-Bi, -Pb, -Th, -Ag, -Mn), F3 (Rb, Li, Cs, Ga, Co, V, Sc, Ni), F4 (-Zn, -Cd, -In), F5 (As, Ge, Sb, Cu), of which F2, F3 and F5 represent metallogenic element groups. For level 846 there exist three principle factors: F1 (Ti, Ga, Th, Ta, Hf, Rb, Zr, Sc, Nb, ∑REE, Cs, Cr, V, Ni, Li, Co), F2 (-Bi, -Ge, -Pb, -Ag, -Zn, -Cu, -Sb, -Cd), F3 (In, As, Mo, U), of which F2 and F3 may be metallogenic indicators. According to above results, the evidences for origin of ore-forming materials have been found: i) The metallogenic process can mainly be divided into two periods: sedimentary diagenetic period and hydrothermal period. The later can further be divided into the pyrite-sphalerite stage, the sphalerite stage, the galena-sphalerite stage and the carbonate-pyrite stage; ii) Zn derived from strata (C1b and C2w) and the external ore-forming fluids. Pb was mostly brought in by the external ore-forming fluids. Therefore, with the study on REE(Hu B. et al, 2003), the information above can indicate that the deposit is a sedimentary-reformed type deposit. Granted jointly by the funds for Fostering Medium-aged and Young Academic and Technical Pioneers (the NSF of Yunnan Province) (99D0003G), Zhaotong Lead-zinc Mine (2001-1) and the Collaboration Program sponsored by the colleges and universities of Yunnan Province (2002UBBE05B004).
Assessing the performance of BLEG to detect gold anomalies in stream sediment geochemistry (Portugal)

F.J. DA SILVA AND A.M.C. LIMA

Geology Centre of the Univ. of Porto (fjsilva@fc.up.pt, allima@fc.up.pt)

Introduction

Geochemistry in mineral exploration is of fundamental importance in defining targets. Among several methods, stream sediment surveys are widely used, in the reconnaissance of prospective terrain, to identify anomalous drainage basins for follow up. The BLEG (Bulk Leach Extractable Gold) method is very sensitive for detecting the existence of gold in stream sediment, as well as cost effective and therefore commonly applied.

BLEG exploration programme

Northern Portugal has several geological environments which bear auriferous mineralizations. Gold has been mined in the region since Roman times, and the potential for new discoveries is significant. A stream sediment BLEG sampling programme was carried out to evaluate the potential along the trend of the Régua-Verin Fault system. Due to high rainfall, relatively warm temperature, high water runoff and active erosion, the method was adapted, regarding sampling technique, to the specific conditions of the area.

The BLEG assays were first subject to multivariate analysis which has shown two uncorrelated groups. One comprised by Cu, Pb and Zn and the other by Au (Ag, As), which conforms with the mineralization of the area. Geostatistical studies followed aiming to enhance geochemical patterns and trends. Several gold targets were revealed. Since the effectiveness of the new BLEG sampling approach was not known, a procedure to validate its results was applied. It consisted in a target validation process, where anomalous basins were followed up.

Conclusions

Field checking has demonstrated that not only the adapted BLEG method was able to disclose areas with already known mineralization, but also to focus on completely new areas, where the presence of prospective rocks have been later detected.

References


S, Pb, C and O isotope evidences for deposit genesis in the Huize carbonate-hosted Zn-Pb-(Ag) district, Yunnan, China

HAN RUN-SHENG, HUANG ZHI-LONG, CEN JIN, MA GENG-SHENG AND ZOU HAI-JUN

1Kunming University of Science and Technology, Kunming 650093, P.R. China (hrs331@sohu.com, mgs1949@sohu.com, zouhaijunlmq@yahoo.com.cn)
2Institute of Geochemistry, CAS, Guiyang 550002, P.R. China (hrs331@sohu.com, hzligcas@hotmail.com)
3Huize Pb-Zn Mine, Yunnan 654211, P.R. China (chenjun1965x@sohu.com)

The Huize Zn-Pb-(Ag) district is a typical of the important medium- to large-size, high-grade Zn-Pb deposits in the Sichuan-Yunnan-Guizhou Pb-Zn metallocenic region, which contains seven are large Pb-Zn deposits in the region of northeastern Yunnan. The Huize district contains the Qilinchang (including Dashuijing), Kuangshan small-sized deposits, and the Yinchangpo small-sized deposit. Geotectonically, the district is in the south-central region at the southern margin of the Yangtze Craton and in the southern part of the northeastern Yunnan basin. Regionally, it is at the intersection of NE-, SN- and NW-trending tectonic zones between the Xiaojiang fault zone and the Zhaotong-Qujing concealed fault zone. Tectonically, the ore district is in the Kuangshan fault and structural zone in the southwestern segment of the Dongchuan-Zhenxiong NE-trending tectonic zone.

These deposits are located above where the basement of the Kunyang Group is composed of the low-grade greenschist-facies metamorphic rocks (Han et al., 2000), and is overlain by Upper Sinian and Palaeozoic rocks. The cover rocks consist of Middle-Upper Devonian, Carboniferous and Permian rock sequences. The Lower Carboniferous Baizuo Formation is the principal ore-host and is composed chiefly of grayish-white and yellowish-red coarse-crystalline dolomite, compact light-gray limestone, and siliceous dolomitic limestone interbedded with barite. Magmatic activity is marked by the Late Permian Emeishan basalt (K-Ar ages: 218.6 to 253.3 Ma) (Liu et al., 1999). The aerial distribution of the basalts generally coincides with the area distribution of the Pb-Zn deposits (occurences).

The S isotopic composition of minerals, such as sphalerite, galena, pyrite and gypsum, is generally similar to that of global Carboniferous seawater sulphate that has values ranging from 15 to 20 ‰ (Claypool et al., 1980), suggesting that S in the ore was derived predominantly from evaporite rocks in the strata. The Pb isotopic composition of ore minerals is homogeneous, and is similar to that of the basalts in the region.
REE characters of sulphide oxidation zone of Xinqiao massive sulphide deposit of Anhui, China

JIANFENG GAO AND JIANJUN LU
State Key Laboratory for Mineral Deposits Research, Department of Earth Sciences, Nanjing University, Nanjing, 210093, China (gao@icpms.nju.edu.cn)

According to oxidation intensity of the Xinqiao massive sulphide deposit, the sulphide oxidation profile can be roughly divided into four zones from the surface to the deep: intensive oxidation zone (Zone I), oxidation zone (zone II), weak oxidation zone (zone III) and primary sulphide zone (Zone IV). The total REE contents of the Zone III and IV (3837–6117 ppb and 1150–4513 ppb respectively) are higher than those of the zone I and II (13–58 ppb and 58 ppb respectively), whereas the zone I and II have high Eu/Eu* values (0.60–0.72 and 0.51–0.66 respectively), whereas the zone I and II have high Eu/Eu* values (2.29–13.9 and 1.69 respectively). The zone I and II have the Ce/Ce* values of 0.42–0.69, showing obvious Ce negative anomaly, but the zone III and IV with Ce/Ce* values of 0.86–1.18 have no obvious Ce anomaly. Their REE distribution pattern (Fig. 1) shows that the zone I and II have obvious slope toward La and positive Eu anomaly, the zone III is characterized by strong LREE enrichment and negative Eu anomaly, and the zone IV has flatten REE distribution pattern and obvious negative Eu anomaly. These indicate that with the increasing oxidation degree the total REE contents and Ce/Ce* values descend and the Eu/Eu* values increase from the zone IV to the zone I. The total LREE contents and LREE/HREE ratios of the zone III are higher than those of other zones, suggesting that oxidation of sulphide minerals may resulted in strong enrichment of LREE in weak oxidation zone.

Acknowledgement
This work was financially supported by Natural Science Foundation of China (No.49673187).

Fig. 1 Chondrite normalized REE distribution pattern

The red-clay-type gold deposit in China

ZHENMIN GAO, YU YUNMEI, ZHUSHEN YANG AND WENBO RAO
Institute of Geochemistry, Chinese Academy of Sciences, Guiyang, China, 550002

Large amounts of the red-clay-type gold deposits have been discovered in the southwestern China. This type is quite different from the lateritic gold deposit outside of China both in compositions and ore-forming mechanisms.

This type has following characteristics.
(1) Tectonic: Cenozoic structures provided favorite conditions for forming karst morphology and for forming ore-hosting reservoirs for the red-clay-type gold mineralization.
(2) Lithology of parent rocks: Parent rocks of this type gold deposits in China are mainly thick carbonate rocks, which are underneath the orebody of this red-clay-type gold deposit, have been intensively karst eroded.
(3) Forms of orebody: Forms and thickness of orebodies are controlled by the unconformity contacts underneath the weathering residua.
(4) The weathering residuum profile: Most of red clay layers hosting gold deposits are relatively thin and did not develop mottled zone and ferruginous zone.
(5) Chemical compositions: The red clay layers which hosted the red-clay-type gold deposits in China contain high content of SiO₂ (> 55%), mainly less than 20% of Fe₂O₃ (with the highest of 25%), and less than 20% of Al₂O₃.
(6) Mineral assemblages: mineral assemblages include major illite and chlorite of 2:1 clay minerals, minor kaolinite and halloysite of 1:1 clay minerals, and trace iron and aluminum oxides and hydroxides.
(7) State of gold: Gold normally occurs nanometer sized tiny native particulates with majority of 50-500 nm and occasional micron in size.
Source of salt in hydrothermal fluids based on Na-Cl-Br of fluid inclusions

ALBERT H. HOFSTRA AND POUL EMSBO

U.S. Geological Survey, MS-973, Box 25046, Denver, CO 80225, U.S.A. (ahofstra@usgs.gov, pemsbo@usgs.gov)

Ion chromatographic analyses of fluid inclusions from a diverse selection of hydrothermal ore deposits show that the source of salt in hydrothermal fluids can be discriminated on Na/Cl vs. Cl/Br plots. Previous studies [1, 2] have shown that saline inclusions in MVT [N=13] and sedex [N=1] Pb-Zn deposits are produced by the evaporation of seawater (Fig. 1 inset). Our data show that the fields for (1) magmatic hydrothermal deposits in deep to shallow environments associated with I- to S-type magmas [N=9] and (2) Phanerozoic mesozonal orogenic gold deposits [N=4] are distinct (Fig. 1); consistent with isotopic evidence for magmatic and metamorphic fluids in each class of deposits. These fields are used to evaluate the source of salt in other problematic deposits. Nevada Carlin-type gold deposits [N=4] plot within, or near, the field for orogenic deposits suggesting magmatic fluids were not important in their formation. Distal disseminated gold deposits [N=5] consistently plot within and outside the magmatic hydrothermal field suggestive of mixing between magmatic and external fluids. In the Donlin Creek district, the Dome Cu-Au deposit plots in the magmatic field and the paragenetically younger Lewis epizonal orogenic Au deposit plots near the orogenic field supporting a recent interpretation [3]. The results demonstrate the utility of fluid inclusion Na-Cl-Br data for ore genesis research.

Figure 1: Na/Cl vs. Cl/Br of fluid inclusions.

References

Devil Pike Brook gold deposit, south-central New Brunswick: An example of a mesothermal lode gold system in the Canadian Appalachians

JONATHAN LAFONTAINE1, KATHLEEN G. THORNE2, and DAVID R. LENTZ3

1University of New Brunswick, Department of Geology, PO Box 4400, Fredericton, New Brunswick, Canada, E3B 5A3 (jonathan.lafontaine@unb.ca)
2New Brunswick Department of Natural Resources, Geological Surveys Branch, PO Box 6000, Fredericton, New Brunswick, Canada, E3B 5H1

The Devil Pike Brook occurrence is a gold-bearing quartz-carbonate vein system hosted within greenschist-grade mafic volcanic rocks of the Grant Brook Formation (Mascarene Group) in south-central New Brunswick. Structurally controlled, quartz-carbonate veins are generally north-trending, but oblique to the regional NE structural trend. Three major drilling campaigns between 1994 and 1996 (59 drill holes) have defined three mineralized zones: “Baxter”, “16”, and the most significantly mineralized “Boyd” from north to south, respectively.

Average values of 15 mineralized samples have gold, silver, nickel and copper concentrations of 27 ppm, 7 ppm, 23 ppm, and 9600 ppm respectively. Resampling of quartz-carbonate veins in drill core from the Boyd Zone has confirmed gold concentrations in excess of 80 ppm (2 samples of 25 and 30 cm in length). A 15 cm long channel sample across a quartz-carbonate vein exposed at the discovery trench (Baxter Zone) contained 47 ppm gold. Associated sulfide minerals identified include abundant pyrite, lesser chalcopyrite and reported minor sphalerite and trace arsenopyrite. The proportions of gold, silver, nickel, copper, zinc, lead, and tin in the Devil Pike Brook occurrence are comparable to other greenschist-hosted, gold-quartz deposits.

Multi-element lithogeochemical analyses (ICP-ES, ICP-MS, INAA) were conducted on 8 host rock samples and 29 quartz-carbonate vein samples (a total of 37 samples from 15 drill holes in 3 zones and 18 channel samples from one outcropping quartz vein). Pearson’s product correlation coefficient (r) on log results indicate a positive realtionship between gold and silver (r = 0.88), copper (r = 0.83), tellurium (r = 0.74), arsenic (r = 0.72), and sulfur (r = 0.72). Average sulfur and arsenic content in the 15 mineralized samples is approximately 4 wt% and 304 ppm, respectively. Average tellurium content in mineralized samples (8 ppm) is anomalous.
Adapted BLEG method in stream sediment geochemistry at Régua-Verin Structure (Portugal)

A.M.C. Lima¹ and F.J. Da Silva²

¹Geology Centre of the Univ. of Porto (allima@fc.up.pt)
²Geology Centre of the Univ. of Porto (fjsilva@fc.up.pt)

Introduction

Régua-Verin Fault System is part of a major lineament that runs on a 020ºN trend from the Atlantic coast in central Portugal to the Bay of Biscay in Spain. Exploration in the Portuguese sector was carried out in this multiple braided strike-slip system within a corridor approximately 20km wide, by Minas Romanas (MR) in the late 90’s. The gold mineralization occurs, in late to post kinematic quartz veins and stockworks, associated with arsenopyrite and pyrite.

Extensive alluvial, eluvial and coarse grained hard rock gold has been mined in the past. Romans produced more than 40 million ounces from northern Portugal and north west Spain (Harford et al. 1998).

BLEG stream sediment geochemistry

The aim of the use of Bulk Leach Extractable Gold (BLEG) in the geochemistry exploration program was to find the refractory, fine grained, invisible and covered gold deposits not exploited by the Romans.

Very large sample volumes were required (from 8 to 25kg) because in northern Portugal, samples are saturated by contrast with samples collected in western USA or Australia. Sample sites were chosen such that an average of 1 square kilometre of drainage was covered. In the field, every tenth sample was duplicated in order to check the reproducibility of the sample sites, the fines volume and the assay laboratory. Despite the low quantity of fines, the assay laboratory had difficulty with the fines and so leach solution volumes were changed in the laboratory.

Conclusions

The exploration by MR in northern Portugal has shown that BLEG is a successful technique for the delineation of both known and unknown gold mineralisations. These results show that BLEG sampling differentiates between coarse grained alluvial and eluvial gold in drainage systems and gold that has derived from refractory, fine grained, invisible and covered gold systems.

Reference


Re-Os age for molybdenite from the Dexing porphyry Cu-Au deposit of Jiangxi Province, China

Jianjun Lu, Renmin Hua and Chunliang Yao

State Key Laboratory for Mineral Deposits Research, Department of Earth Sciences, Nanjing University, Nanjing, 210093, China (lujj@icpms.nju.edu.cn)

The Dexing porphyry deposit including Tongchang, Fujiawu and Zhushahong deposit in northeastern Jiangxi Province of China is tectonically located in the eastern sector of the Mid-Proterozoic Jiangnan orogenic belt and occurs in Jiuling Terrane to the west of Northeast Jiangxi Deep Fault which represents the suture zone between the Juling Terrane and the Huaifu Terrane. The Early Jurassic granodiorite porphyry stocks related to the deposit tare calc-alkaline and high in SiO₂ (60.81 to 66.25 wt%), and show a narrow range in Na₂O+K₂O values (5.31 to 6.84 wt%). These porphyries are enriched in Ba, Rb, Th, U, LREE, and chalcophile elements, depleted in Nb, Y and Yb, and have no obvious Eu anomaly. The SHRIMP zircon U-Pb ages of both the Fujiawu and the Tongchang porphyries are 171 ± 3 Ma (Wang et al., 2004).

Metallogenic epoch is very important to study on matalllogenesis. But the formation age of the Dexing deposit have not been exactly defined. The aim of this paper is to date the highly precise Re-Os age for molybdenite from the deposit and to give constraint on an exact age of ore formation for the deposit. The eight molybdenite samples analyzed in this study were separated from the Tongchang deposit. The eight samples give a good 187Re-187Os isochron. The 187Re-187Os isochron age is 170.4 ± 1.8 Ma (MSWD = 0.40). This age represents the age of Cu-Au mineralization of the Dexing deposit and is remarkably consistent with that of the Tongchang porphyry, suggesting that the formation of the Cu-Au ores is genetically related to magmatism. Cu isotope study also indicated the copper was derived from the magmatic rocks (Lu et al., 2004). The time interval between the metallogenic age and the formation age of the porphyry is little, suggesting that the mineralization occurred rapidly after emplacement of the porphyry magma.

This work was financially supported by Natural Science Foundation of China (No.40373025) and the Major State Basic Research Program of China (No.1999043209).

References

Li stream sediment geochemistry at Barroso pegmatite field (Portugal)

F. NORONHA¹ and A.M.C. LIMA²

¹Geology Centre of the Univ. of Porto (fmnoronha@fc.up.pt)
²Geology Centre of the Univ. of Porto (allima@fc.up.pt)

Introduction

Barroso-Alvão pegmatite field has numerous veins, mostly composed by well mixed aplitic and pegmatic parts (Charoy et al. 2001). According to Černý’s classification, they are rare-element pegmatites of the LCT family and belonging to the complex type. Depending on the dominant lithiumiferous phase, they are spodumene sub-type, lepidolite sub-type or petalite sub-type. These intrusive bodies occur in a metasedimentary host in rock of Ordovician-Silurian age. The surrounding area is closed by different granites, some are predominantly biotitic and others are two mica type.

Stream sediment geochemistry

This process has been used for the last fifty years with remarkable success in identifying areas of high mineral potential (Fletcher 1997). Geochemistry prospecting was carried out by IGM during one year within a 227 Km² area. In this work 665 samples were collected that were analysed for the following elements: Li, W, Sn, Nb and Ta from a fraction lower than 80 mesh. With the obtained results various Li anomalous zones were defined, considering a background value for Li as 99 ppm.

In this study, these anomalous zones were overlapped in the updated pegmatite field geological map. Aware that stream sediment are representative of weathering and erosion products occurred upstream the collected samples, a sedimentary host in rock of Ordovician-Silurian age. The surrounding area is closed by different granites, some are predominantly biotitic and others are two mica type.

Conclusions

This simple methodology allowed the recognition of petalite-bearing pegmatite veins, justifying these lithium anomalies were, until then, justified by spodumene and lepidolite mineralizations.

References


Fault tectono-geochemistry and prognosis of concealed ores in the Tongchang Cu-Au polymetallic orefield, Shaanxi, China

HAN RUN-SHENG¹, LIU XIAO-FENG¹,², MA DE-YUN¹, MA GENG-SHENG¹ and TONG ZHI-CAI¹

¹Kunming University of Science and Technology, Kunming 650093, P.R.C. (hrs331@sohu.com; x dys712dkfy@tom.com; mdy123456@sohu.com; mgs1949@sohu.com; tongzhicai2000@163.net))
²Institute of Geochemistry, CAS, Guiyang 550002, P.R.C. (hrs331@sohu.com)
³Bureau of Northwestern Geological survey, Shaanxi 712200, P.R.C. (xdys712dkfy@tom.com)

The Tongchang ore-field is located in the centre of the Mianxian-Lueyang-Yangpingguan area that is celebrated as a “gold triangle” area, at the juncture of the latitudinal tectonic zone of South Qinling, the Longmenshan Cathysian tectonic zone and the Sichuan-Yunnan longitudinal tectonic zone, where there are distributed Cu-Au polymetallic ore deposits (occurrences) including the Tongchang, Chenjiaba, Qiniabian, Yinshangou and Xiaoyouyi ore deposits (mineralization).

The samples were collected predominantly from the sections on the earth’s surface in the orefield. 251 fault tectonite samples were collected, and each a sample weighs 1-2 kg. All samples were prepared for analysis by ICP-MS techniques (Qi L. et al., 2000) in the Institute of Geochemistry, CAS. 8 main factors of samples for R-mode factor analysis of 18 elements have been obtained: F₁: Pb, Ag, Mn, Zn, Sn; F₂: Cr, Ti with -Co and -Ni; F₃: As, Bi, Mo; F₄: Zr, Pb, Mo; F₅: Sn, Sr; F₆: Cu, Co; F₇: Ti, V; and F₈: -B, -Ba. In combining with the geological condition, the factor F₁ represents the long-range ore-forming element association of meso-epithermal ore-forming solutions; F₃, the element association of mesothermal gold mineralization; F₆, the element association of hyper-mesothermal Cu-Co mineralization. All these factors reflect the metallogenic features of Cu-Au polymetallic deposits in the Orefield.

Tectono-geochemical characteristics and prognosis of concealed ores: (1) Geochemical-anomalies are distributed by way of overlapping or being close to the known orebodies (mineralization), indicating that the anomalies represent the primary halos of orebodies and the areas where mineralization is concentrated;(2) In the Tongchang area, diorite appears the overlapping of meso-hyperthermal and mesothermal element anomalies; in the east and west contact zones of the diorite appears the overlapping or neighboring of hyper-, meso- and meso-epithermal mineralization anomalies, displaying a horizontal zonation.

Therefore, Tectono-geochemical characteristics provide the basis for the localization prognosis of concealed ores.

References

Geology of the Elmtree gold deposit, northern NB, Canada

SABINE VETTER AND DAVID R. LENTZ
Univ. of New Brunswick, Fredericton, Canada
(s.vetter@unb.ca, dlentz@unb.ca)

The Elmtree gold deposit, comprising the Discovery and West Gabbro zones, is located approximately 23 km northwest of Bathurst in the Elmtree ophiolitic Inlier. Approximately 245 m east of the West Gabbro Zone is the Discovery Zone. This small gold deposit is surrounded by deformed slates, greywacke and conglomerate of the Early to Middle Ordovician Elmtree Group (Ruitenberg et al. 1990). The West Gabbro Zone is hosted by a zoned metagabbro that is 3 to 40 m thick, 460 m long, and extends to a depth of at least 250 m. In the field and drill cores, a fine-grained ophitic metagabbro occurs at the margins and grades into a medium-grained subophitic and a coarse-grained metagabbro in the center (Paktunc and Ketchum 1989). This metagabbro discordantly intrudes deformed melange typified by black graphitic and grey partly cherty argillites and slates.

Gold mineralization occurs within predominantly dextral, east-west-trending, subvertical ductile to brittle shear zones (Tremblay and Dube 1991) that cut the metagabbro. The alteration and mineralization is associated with the strongest shear fabric in the metagabbros. Adjacent to these shear zones, the rocks are hydrothermally altered to a greenish grey phyllosilicate assemblage (distal). This assemblage is locally silicificed and overprinted by carbonatization in proximity to shear-hosted, sulfide-bearing carbonate-quartz veins (< 30 cm wide). Near the thicker veins, the coarse-grained metagabbro contain more disseminated sulfides (Ruitenberg et al. 1990) than their unaltered or fine-grained equivalents and silicified zones contain arsenopyrite, pyrrhotite, pyrite, chalcopyrite, and gold (native and refractory). Gold values up to 23.8 g/t have been reported.

The objective of this study is to discern the origin of the hydrothermal fluids and to determine the principal controls of gold mineralization in relationship to the tectonic evolution of the sequence.

References