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DIORITES AS AN INTERMEDIATE LINK IN GOLD-PRODUCING FLUID-MAGMATIC GRANITE-DOLERITE COMPLEXES

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On the example of the Kedrovskiy deposit of North Transbaikalia, conditions of gold-producing fluid-magmatic granite-dolerite complex's making are concretized. Participation in its structure of average igneous rocks, emphasizing in magmatism's generalized antidrome scheme an evolutionary change of early ultrametamorphical granodiorites and quartz diorites of focal-dome construction by moderately alkali quartz diorite porphyrites and further – accompanied by ore-formation of moderate alkaline basaltoids in dyke's facio is shown and is discussed. Presence of diorites in other mesothermal gold deposits reflects, as it is represented, prevalence of the phenomenon of evolutionary transition from early to late magmatities of the discussed fluid-magmatic complexes and explains the expediency of its further studying.

Introduction

In system of proofs of hydrothermal deposits magmatic origin and, hence, magmatism ore-producing ability, the empirical data that exposes space-time correlations of mineralization and derivative magmatic processes, has the essential value as only it can provide, and with appropriate research activity it does provide answer to the question, – owing to which geological events, ore-forming process is realized in nature. It is impossible to get this type of information by means of experiment, theoretical calculations or modeling, – all that can only confirm and explain something that is observed in natural objects.

In the addition to mesothermal gold deposits, formed in different areas and during different epoch, repeatability of ore space-time correlations with magmatic bodies that are certain in structure and origins and formed in certain sequence, which is shown in a number of works [1, 2, etc.], gives the basis to consider such communications not casual, but natural, reflecting the fact that ore-formation is carried out in conditions and owing to high tectono-magmatic activity of Earth's mantle and crust.

In combination with petrochemical, isotopic-geochemical, radiological and other data this pattern is a cornerstone of the offered concept of mesothermal gold deposit formation [3, 4].

According to the concept, accompanied by ore-formation fluid-magmatic geological processes are initiated by activization (heating) of a cloak. In Earth crust top horizons, its material expression is in the form of antidromic fluid-magmatic granite-doleritic complexes, in structure of early sour and late primary with derivatives' increased alkalinity, close in geological age. Sour rocks compose palingenetic plutons (bodies) or mature ultrametamorphical dome structures accompanied by dykes or only dykes of aplites, pegmatites, granite-microgranite-porphyries; all of them bear isotope proofs of formation by means of a crust substratum fusion under influence of cloak heat-carrier fluids or differentiation of basalt melts. In conclusion of complexes making simultaneously with late basic magmatites, but after the beginning of moderate-alkaline basalt melt infusion, gold deposits are formed, phasic ore-mineral complexes of which alternate in time with intra-ore generation of moderately alkali dolerites dykes. Stably sustained basits mineral-chemical compound, including pre-ore, formed, for example, in ore-containing granite bodies of the early stage [1, 2, 4], excludes mixture at the late stage of basalt melts with sour ones. Based on that it is necessary to conclude, that sour melts in the beginning of basaltoid making stage of gold-producing fluid-magmatic complexes have completely hardened and the magmatic centers have turned into bodies of firm rocks. This fact does not go with popular until now opinion [5, 6, etc.] about generation of metal-containing solutions in the centers of granite magma which, as it is noted, did not exist at the beginning of introduction of the first portions of basalt melts and further metal-containing solutions.

At the same time, in some golden-ore fields extremely rare bodies were found, mostly dykes of magmatic rocks with average structure. Their place in schemes of geological events sequence by virtue of their autonomy, absence of data about their age remained not ascertained. Dykes of diorites, microdiorites, diorite porphyrites lie, for example, on deep horizons (450, 510) in southeast part of the early Paleozoic Berikulskiy deposits (the Mariinsky taiga) among ore-bearing integumentary andesites, basalts of the Berikulskiy series of an average Cambrian. Rather powerful, up to 2 m, dyke of diorite porphyrite is found in the core of an underground drilling chink among Archean migmatized gneisses in the area of the Ridge vein of late Paleozoic Irokindinskiy deposits in the South-Muiskiy ridge of North Transbaikalia. Dykes of microdiorites, diorite porphyrites, localized among granites and other ore-bearing rocks are mentioned in old archive materials on the late Paleozoic Karalonskiy, Upper-Sakukanskiy golden ore deposits, and located accordingly in the North-Muiskiy and Kodarskiy ridges of North Transbaikalia. These facts stimulated a special research directed at searches for proofs or a refutation of the assumption about possible participation of average igneous stratums in structure of gold-producing fluid-magnetic complexes and, hence, on specification of their formation conditions.

The assumption has received acknowledgement in the Kedrovskiy golden-ore mesothermal deposit, where the facts providing, as it is represented, the uncontested decision of the question are found. These facts, discussion of the research results and conclusions are shown in this article.

1. Conditions of deposition and dyke age of average magmatic rock of the Kedrovskiy deposit

The Kedrovskiy quartz-vein golden-ore deposit is located on the southern near-water-shed slopes of the South-Muiskiy ridge in North Transbaikalia and formed in late Paleozoic epoch [7] in trailing (east) side of the submeridian Tuldunskiy zone of deep ruptures limiting the Muiskiy ledge of the Archean foundation in the east. Its geological structure is described in [8, deposit 2], therefore here we shall be limited to a summary.

The block of the earth's crust containing gold-bearing veins is combined of the Proterozoic Kedrovskiy strata (series) of terrigeneous carbonaceous feldspar-quartz sand-alevroslants with rare layers of marbleonised limestones. These rocks form east wing of submeridian linear anticlinal fold, falling on the east, southeast (in the south) under moderated (30...50°) degrees. The western wing and locking area of the fold are destroyed by late proterozoic [9] intrusion of gabbro of muiskiy complex.

The central part of the deposit is occupied by apo-slants-ultrametamorphycal matured focal-dome construction in the structure of plate-like concordant to stratification deposit of granodiorites and quartz diorites with capacity about 2,5...3,0 km and length in submeridian direction about 8,0 km in a frame of plagiomigmatites and further from a deposit – almandine-two-mica plagiogneisses. On the border of construction gradual transitions from carbonaceous slates into gneisses are fixed. Radiological definition on fresh biotite of plagiomigmatites has shown the age of 335±5 mln. years (table 1).

Table 1. *Age of biotite ultrametamorphytes, dykes' igneous rocks and metasomatites of the Kedrovskiy and Irokindinskiy (*) golden-ore deposits*

Sample number	Name of the rock	Analyzed material	Content			Age, mln. years
			K, mass. %	$^{40}K \cdot 10^{-7}$, g/g	$^{40}Ar \cdot 10^{-7}$, g/g	
К-414	Plagiomigmatite	Biotite	6,35	75,76	1,640	339±2
К-415			6,81	81,24	1,778	342±13
К-416			6,81	81,24	1,636	317±4
К-417			7,06	84,23	1,816	337±1
К-480			5,26	62,70	1,366	341±5
Average						335±5
8Ш1-Р34-3(*)	Micro-granite-porphyr, dyke	Rock	3,16	37,6	0,7598	318±1
КП-52	Diorite-porphyrite, dyke	Rock	1,99	23,8	0,4514	300±5
КП-2	Diorite-porphyrite, dyke	Berezite	2,26	27,0	0,4873	287±2
КШТ-3	Micro-granite-porphyr, dyke	Berezite	1,99	23,8	0,4118	275±3

Note. 1) The age was defined by K-Ar method in CL PGU «Zapsibgeology» (Novokuznetsk city, analyst – V.M. Kisenko's), relative error of the analysis is no more than ±5 %. 2) The content of argon was defined by isotope dilution method with application of ^{40}Ar as tracer agent. Allocation and purification of radiogenic argon were done on all-metal installations developed and made in ЦЛ ПГО «Zapsibgeology». Measurement of isotope structure of argon is executed on weights-spectrometers MI-1291. Accuracy of measurements was controlled by the analysis of isotope structure of air argon and measurement of radiogenic argon content in one of the master samples. All definitions were duplicated by parallel measurements. Potassium was defined by the ardently-photometric method. 3) For age's calculation the constants were used: $\lambda_e=0{,}581 \cdot 10^{-10}$ 1/year; $\lambda_\beta=4{,}962 \cdot 10^{-10}$ 1/year; $^{40}K=K(\%) \cdot 11{,}93 \cdot 10^{-7}$ g/g. 4) The additional evaluation of results' correctness' is quoted in [7]

Gold-bearing quartz veins, zones of streak-interspersed ores and deposits of beresitoids mainly lie in carbonaceous slates strata, partly in ultrametamorphytes and magmatites of focal-dome structure. Near-vein berisites and ores represent mesothermal type of gold deposits and are formed 282±5 mln years ago [7, samples with index K...]

Interesting to us dykes of average igneous rocks are found in the north of the deposit in gorge rocky exposures of the Piningeyskiy (fig. 1) and Shamanskiy (fig. 2) streams. Dykes capacity, focused approximately perpendicular to one another, makes 8 and 10 m, both courses are hidden under rock-streams. Visually they are diagnosed as diorite porfyrities.

The Peniginskaya dyke has submeridian prodeleting, lies among gneissed sand-slates, in hanging layer it is accompanied by golden-ore Pineginskaya-I sulfide-carbonate-quartz vein, in contact with the latter contains thin beresite frame and is crossed by dolerite dyke. Through transparent water of a mountain stream on depth of about 1 m in an abrupt board of a channel, the crossing of dolerite dyke by the Pineginskaya-I vein and its clarification in exocontact with the latter, which is proved by pre-ore age of the dyke. The Shamanskaya dyke of diorite porphyrite is crossed by the golden-ore

Shamanskaya-III vein and dolerite dyke, an abundance of epigenetic biotite in which, as well as in the east dyke in fig. 1, defines its implements to a totality (set) of intraore, which during ore-formation performed the function of thermal fluid-conductors [1].

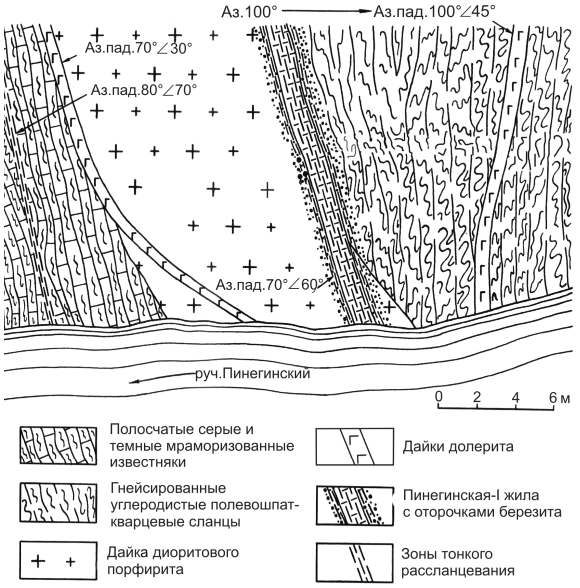

Fig. 1. *Crossing of diorite porphyrite dyke of the Kedrovskiy golden-ore deposit by dolerite dyke and the sulfide-quartz Pineginskaya-I vein (plan). Left column (top to bottom): 1) Striate grey and dark marbleized limestones; 2) Gneised carbonic feldspar-quartz shales; 3) Diorite porphyrite dyke. Right column (top to bottom): 1) Dolerite dyke; 2) The Pineginskaya-I vein with beresite frame; 3) Zones of thin shale*

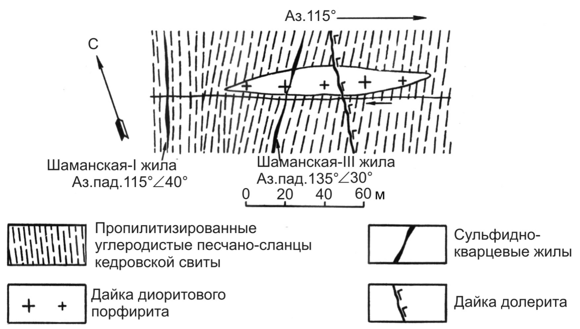

Fig. 2. *Crossing of diorite porphyrite dyke of the Kedrovskiy golden-ore deposit by the sulfide-quartz Shamanskaya-III vein and dolerite dyke (plan). Left column (top to bottom): 1) Proptized carbonic sand-shales of the Kedrovskiy series; 2) Diorite porphyrite dyke. Right column (top to bottom): 1) Sulfide-quartz veins; 2) Dolerite dyke*

As it is possible to see in table 1, radiological data is coordinated with the resulted space-time correlation of ultrametamorphytes, dykes and golden-ore veins.

2. Structure specification of average magmatic dykes of the Kedrovskiy golden-ore deposit

Dykes composed in massive full-crystal rock of motley-grey color, finely-medium-grained (up to 3...5 mm) in the bulk. The porphyritic structure of the rock is formed by participation of lime-alkaline feldspar porphyritic discharges in the size up to 15 mm, consisting of not zonal table-like or subisometric crystals and joints of andesine crystals (from № 33) up to labradorite (№ 51). The volume of porphyritic discharges does not exceed 30 %. In the bulk prevails andesine (up to 40 %) in accretion with ordinary green amphibole (up to 25 %), red-brown biotite (up to 20 %), quartz (up to 10 %), sometimes orthoclase with poorly expressed perthite structure (up to 10 %). The listed minerals are distributed in dyke volume non-uniformly – sites of color minerals enrichment alternate with shlieren-like , lens-striate or more complex in configuration sites of leucocratic rocks which have been depleted by them. All basic minerals are peculiar to large (many mm) and fine (shares of mm) forms. Attributes of amphibole replacement by biotite, down to its relicts in units' fine flakes of latter**,** weak replacement by ortoclaz, quartz plagioclaz, are observed. Among accessory minerals apatite, sphen, and zircon are noticed.

In full, dykes are engulfed by near-vein hydrothermal changes, Mineral-petrochemical profile of which is examined below. Nevertheless, local sites (remnants) have been preserved, generally in dyke central parts where changes are minimal. As stated earlier [2], it is possible to judge about it based on insignificant, up to 10 %, volume of mineral new growths and low content of carbonic acid (table 2) – the sensitive indicator of rocks' degree of changes in beresite process.

As it seen on the TAS-diagram (fig. 3), rocks according to correlation of silice and alkalis correspond to quartz diorite and moderately alkali quartz diorite. The top and bottom figurative points here reflect non-uniformity of a single the Pineginskaya dyke composition, as both tests were selected from it. Since alkaline feldspar is present in dykes, even though it is distributed rather non-uniformly, rocks should be qualified as moderately alkali biotite-amphibole quartz diorite or quartz monzonite. At the same time, rocks are related to high-alumina and belong to potassium-natrium petrochemical series (fig. 4).

Table 2. *Chemical compounds of diorite porphyrites in subzone of weak change of an external zone of near-vein metasomatic auras of the Kedrovskiy golden-ore deposits*

Distance from golden-ore veins, m	Content, mass. %														Σ
	SiO_2	Al_2O_3	K_2O	Na_2O	S sulfide	CO_2	CaO	MgO	FeO	Fe_2O_3	TiO_2	MnO	P_2O_5	H_2O^+	
6,0	57,24	15,67	2,86	4,10	0,20	0,27	3,91	3,01	5,90	4,03	1,22	0,20	0,24	1,45	100,30
4,5	58,81	15,24	2,66	4,10	0,17	0,27	4,04	2,61	6,62	2,43	1,45	0,22	0,29	0,80	99,71
1,5	59,55	15,86	2,38	2,28	0,29	0,63	3,07	3,31	6,64	3,05	1,42	0,18	0,07	2,09	100,82

Note. Full chemical silicate analyses of igneous rock and formed based on them metosomatites (tab. 3) are performed in CL PGU «Zapsibgeology», Novokuznetsk city, under supervision of I.A. Dubrovskaya

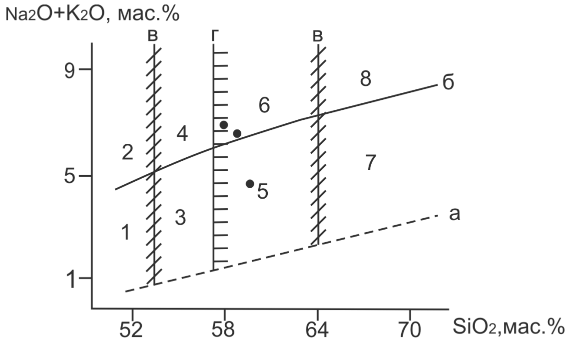

Fig. 3. *Position of dykes' average structured magmatic rocks of the Kedrovskiy golden-ore deposits in coordinates SiO_2 – (Na_2O+K_2O). The bottom borders of chemical compounds distribution: magmatic rocks (a), moderately alkali rocks (b); borders of magmatic rocks division into groups based on silice content with «fields of uncertainty» (c); border of quartz expansion >5 % (d). Areas of distribution of kinds of magmatic rocks: 1) gabbroids, 2) moderately alkali gabbroids, 3) diorites, 4) moderately alkali diorite-monzonites, 5) quartz diorites, 6) moderately alkali quartz diorites – quartz monzonites, 7) granodiorites, 8) quartz sienites. Borders of areas of magmatic rock's chemical compounds distribution are borrowed from [10]*

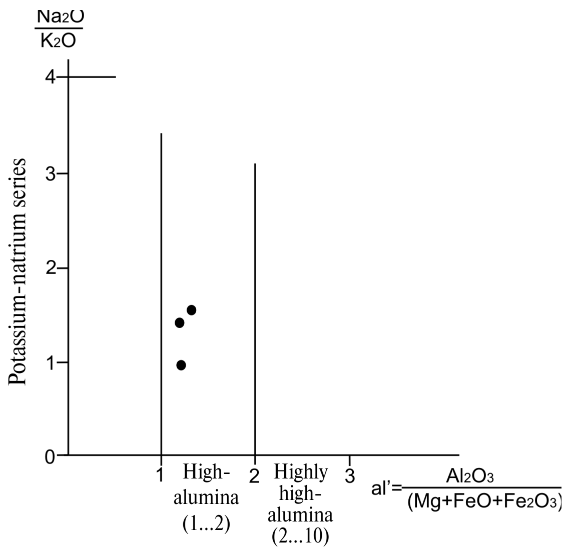

Fig. 4. *Position of dykes' average structured magamatic rocks of the Kedrovskiy golden-ore in coordinates Na_2O/K_2O – $Al_2O_3/(MgO+FeO+Fe_2O_3)$*

3. Near-vein metasomatic transformations of moderate alkaline quartz diorite porphyrites dykes

Near-vein metasomatic auras, formed in dykes of moderate alkaline quartz diorite porphyrites, include external, intermediate, rear and axial zones. Their change, the example of Pineginskaya dyke, defines the following order of mineral zoning (minerals that disappear in rear zones are underlined).

External zone: sericite+quartz+leucoxene+rutile+magnetite+pyrite±dolomite-ankerite+albite+chlorite±clinozoisite; source: amphibole±biotite;

Chlorite zone: sericite+quartz+leucoxene+rutile+magnetite+pyrite+calcite+dolomite+albite+chlorite±clinoziosite;

Albite zone: sericite+quartz+leucoxene+rutile+magnetite+pyrite+calcite+dolomite+albite;

Rear zone: sericite+quartz+leukoxene+rutile+magnetite+pyrite+calcite+dolomite-ankerite;

Axial zone: quartz+carbonates+sulfide+gold.

The internal border of the external zone is situated in 1,35 m from the vein, chlorite – in 0,6 m; the volume of the aura in the interval 0,6...0,01...0,0 m is occupied by the albite zone. The rear zone has capacity no more than 1,0 sm, the axial zone is presented by a gold-bearing quartz vein.

In the volume of each zone and aura as a whole, in direction to quartz vein the intensity of rock mineral-chemical transformations increases: replacement of initial rock color minerals increases down to their full disappearance on internal border of the external zone, albitization of initial feldspars, muscovitization of chlorite with accumulation of residual leukoxene, rutile, magnetite, enrichment of rocks by carbonates. Despite the lack of data about the chemical compound of rear zone rock owing to its small volume it is necessary to ascertain essential (up to 90 ... 95 %) subtraction of sodium from it (albite, the only carrier of metal, disappears), potassium addition, sulfurs, carbonic acids, substantiated in sericite, prite, carbonates and fixed in albite and even chlorite zones (table 3). Migration of other petrogenic components is less expressed, except magnesium and iron, partially deleted from intermediate zones.

Table 3. *The coefficients of distribution (addition >1, subtraction <1) of petrogenic elements in mineral zones of near-vein metasomatic aura, formed in dyke's diorite porphyrite of the Kedrovskiy golden-ore deposit*

Mineral zones (number of samples))	Chemical elements														Δ
	Si	Al	K	Na	S Sulfide.	$C_{кб.}$	Ca	Mg	Fe^{2+}	Fe^{3+}	Ti	Mn	P	H (H_2O^+)	O	
Chlorite (2)	0,9	1,1	1,0	1,1	1,5	3,8	0,9	1,0	1,1	0,9	1,0	1,0	1,0	1,7	1,0	5,1
Albite (2)	0,9	0,9	1,4	0,9	3,9	14,0	1,5	0,7	0,9	0,6	1,0	0,9	0,8	0,7	1,0	11,7

Note. 1) The coefficients of elements distribution in metasomatites of rather poorly changed diorite porphyrite from the external zone of near-vein metasomatic aura (3 samples) are obtained with use of results of petrochemical recalculations by volumetric-nuclear method of full chemical silicate sample analyses. 2) Δ – the unit weight of mixed (addited and subtracted) substance in percentage to weight of initial rock's substance in standard geometrical volume 10000 $Å^3$

4. Discussion of results and conclusions

The resulted radiological definitions of minerals and rocks absolute age of the Kedrovskiy deposit, the correctness of which is appliable to K-Ar isotope system is reached by observance of series of conditions and is shown in [7], are coordinated with the sequence of interesting us fluid-magmatic processes, which is proved by structural and time correlations of these process derivatives.

The spatial and time affinity of mature ultrametamorphical focal-dome constructions of Kedrovskiy area deposit, including the western, participating in the structure of an occupied by the deposit earth's crust, the dome, to northern frame of the Angaro-Vitimskiy batolite in the structure of vitimkanskiy and barguzinskiy granite complexes of late Paleozoic [11–13] is explainable from a position of representations about conditionality of formation of both by grandiose, as far as scales, cloack activization [14]. In the earth's crust, the last was expressed in matriculation from cloak, possibly, nuclear-cloak «the hot point» or «plume» a huge stream of fluids-heat-carriers and, as consequence, – in substratum fusion. Intrusion of one out of peripheral northern jets of this stream has caused ultrametamorphizm of Proterozoic strata and creation in the Kedrovskiy area deposit of mature focal-dome structure – several local domes.

All the subsequent events up to formation of the Kedrovskiy and, possibly, other gold deposits of North Transbaikalia are caused by functioning of this cloak-crust fluid-magmatic system. Partial substratum fusion during ultrametamorphism is related to the Kedrovskiy's rod of quartz diorites and granodiorites formation, and also later series of sour dykes -pegmatites, aplites, microgranite-porphyries, deposited in the rod and other rocks in the area. Sour magmatizm in the pre-ore phase was replaced by intrusion of moderate alkaline melts of the average, and then the basic structure before early portions of metal-bearing solutions have acted. At the stage of ore-formation, as it was noticed, adjournment of ore mineral complexes from subsequent portions of metal-bearing solutions alternated with introduction of moderate alkaline basalt melts. Considering the age of focal-dome construction and gold deposits of North Transbaikalia (Irokidinskiy, Kedrovskiy, Zapadniy, Karalonskiy, Bogodikanskiy, Verhne-Sakukanskiy) [7], gold-generating fluid-magmatic complex was formed in an age interval of 335±5...275±7 million years.

Proofs of the given scheme of geological events, except average structured magmatizm, are shown in [1–4]. Participation of average structured magmatites among derivatives of fluid-magmatic geological, including ore-forming, process and their place in this process, i.e. time of formation, is proved by the facts resulted above by the example of Kedrovskiy deposit. Among the last are informative: 1) participation of moderate alkaline diorite porphyrite dykes in the structure of the Kedrovskiy deposit, 2) deposition of one of the dykes among ultrametamorphized (gneissed) slates, 3) crossing of diorite porphyrite dyke by pre-ore moderately alkali dolerite dyke, 4) crossing or accompaniment of moderately alkali diorite porphyrite dyke by golden-ore veins, 5) near-vein replacement of these dykes by metasomatites of propylite-berizste type, by ordinary for mesothermal gold deposits, including Kedrovskiy [1, 2, 14].

Considering rather stable mineral-chemical compound of moderately alkali diorite porphyrites here and, based on preliminary data, in other deposits, the conclusion about generation of average structured moderately alkali melt during the process of basalt magmatic differentiation, instead of by means of earth crust stratum palingenesis or by mixture of melts with different structure is represented preferable. In the latter case it would be necessary to expect wide variations of kinds and versions of magmatic rocks, which is not observed.

The shown fact of diorites participation as intermediate link between early granitoids and late basaltoids within the limits of fluid-magmatic process, which created them and the Kedrovskiy deposit, judging by the presence of average rocks in other gold mesothermal deposits, does not make exception.

The objective of further research is to specify scales and conditions of diorite, including, possibly, moderate alkaline, generation of melts with functioning of cloak-crust gold-producing fluid-magmatic systems.

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GEOCHEMICAL ZONALITY OF SKARN-GOLD DEPOSITS OF THE WESTERN SIBERIA. P. 1.

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Geochemical zonality of Western Siberia gold-skarn deposits has been investigated. Concentric zonal construction of geochemical fields' anomalous structure accompanying studied deposits has been revealed. Groups of concentrating and deconcentrating (in relation to golden-ore bodies) elements have been defined. Close spatial relation between gold and chalcophile satellite elements complex, set of which can vary depending on evolution degree of hydrothermal system, has been established. The set of deconcentrating elements, accumulated on periphery of ore bodies is standard in general and includes Ni, Co, Cr, V, Ba, Mn. In the first part of the article the geochemical zonality of the Sinychinskiy type deposits has been examined, the second is devoted to zonality of the Kazsk ore field and discussion of the results

Skarn-gold deposits are widespread in folded structures of the Altai-Sayansk folded area, but their industrial estimation is always interfaced to significant difficulties. Ore bodies of such deposits, as a rule, are characterized by high concentration of well extracted gold, but have usually very complex morphology and small sizes. In these conditions the objective estimation of new ore-displays is possible with use of complex geochemical criteria developed and tested on well studied deposits.

In correlation to accompanying magnetite mineralization skarn-gold deposits of the Altai-Sayansk folded area form a continuous row within the limits of which it is possible to allocate two extreme types, differing in geo-industrial specialization: 1) golden ore and copper-golden ore and 2) gold-magnetite. As reference objects for research of geochemical zonality we have chosen: for the first group – the Sinyhinskiy ore field (Mountainous Altai), for the second group – the Kazsk ore field (Mountainous Shoriya). In the first part of the article geochemical zonality of the Sinyhinskiy type deposits is considered, the second is devoted to zonality of the Kazsk ore field and discussion of the results.

The earliest geological complexes of the Sinyhinskiy ore field are products of the late-island-arch development stage ($Є_2$–$Є_3$) of the Sarisazskiy sector of the Altai-Severosayanskiy volcano-plutonic belt [1]. The stage is marked by accumulation of volcanogenic-sedimentary strata accompanied by subaerial outpourings of basalt, andesites, andesibasalts of the Ust-Seminskiy retinue ($Є_2$). The main volcanites relate to low-potassium series of normal alkalinity and are classified by lime-alkali basalts of island arches [2]. The stratum contains layers, lenses and biohermic limestone massifs favorable for formation of gold-skarn mineralization.

Intrusive magmatism of that period is presented by the Sarakokshinskiy massif ($Є_3$), where gabbroids and plagiogranites are mapped. According to Sm-Nd isotope dating plagiogranites of the Sarakokshinskiy massif are 587 million years old [3].

Homodromicaly constructed volcanites with high alkalinity of the Nirninsko-saganskiy series and granitoids of the Sinyhinskiy complex relate to formations of the Salairo-Altaiskiy devonian-earlycoal volcano-plutonic belt.

The Sinyhinskiy plutonic diorite-tonalite complex (D_1) is composed of rocks of 4 phases: 1) gabbro; 2) diorites, quartz diorites; 3) tonalites, granodiorites; 4) granites. By means of uranium-lead dating on zircon from quartz diorites the number 400±28 million years has been received [3]. Based on petrogeochemical parameters, complex granitoids relate to weak contaminated granites of the I-type of andesite row. Gold-copper-skarn deposits of the Sinyhinskiy ore field are connected with complex granitoids.

Industrial gold mineralization is dated to stratiform deposits of infiltrational limy skarns that had generated on contacts of limestones and volcanites. Their gold-bearing ability is caused by the imposed processes of silicification and sulfidization. Below, in tables 1, 2 skarns with imposed mineralization for brevity are named «ore», without it – «nonore». Zonal accommodation of skarn and ore minerals, concerning joint knots of brake