DOI: 10.18454/PMI.2017.1.20

UDC 553.411 (571.61)

DEPOSITS OF GOLD-QUARTZ FORMATION IN THE PRIAMUR PROVINCE

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A description of gold-quartz formation deposits in the Priamur gold province is presented. Prevalence of gold-quartz deposits defines metallogenic profile of the province and presence of numerous rich placers.

Deposits are attributed to frontal, middle and near-bottom parts of the ore pipe. Frontal part of the ore pipe contains a major part of the deposits. They are small and consist of scattered quartz, feldspar-quartz and carbonate-quartz veins. The ore is characterized by erratic percentage of gold, bonanzas can be found. Gold is free, ranging from fine to big grains and small nuggets. It is associated with arsenopyrite, galenite, sometimes with antimonite. Among trace elements can be copper, mercury, antimony and arsenic. Prevalence of frontal deposits in the province points to significant prospects of finding a rich deep mineralization in the middle part of ore pipe.

Middle part of the ore pipe contains intermediate and small deposits. Ore bodies are often represented by veined and veinlet-disseminated zones, sometimes zones of metasomatites. For gold-quartz ores, free native gold can commonly be found, usually of fine and very fine grain size. Among ore minerals, apart from arsenopyrite, pyrite and galenite, scheelite is frequently observed.

Small deposits of near-bottom ore pipe are quite rare. Ore bodies are represented by quartz veins and zones of metasomatites. Gold is mostly free, of fine and super fine grain size. The prevailing trace element is mercury. Attribution of gold-quartz deposits to a certain part of ore pipe can facilitate more precise estimation of their prospects. In its own turn, this will allow to choose more favorable objects for further evaluation.

***Key words*:** province, gold deposits, placer, native gold

***How to cite this article*:** Stepanov V.A., Mel'nikov A.V. Deposits of Gold-Quartz Formation in the Priamur Province. Zapiski Gornogo instituta. 2017. Vol. 223, p. 20-29. DOI: 10.18454/PMI.2017.1.20

Judging by overall amount of gold mining, which since year 1968 exceeds 1 kilotonne, the Priamur gold province is one of the leading ones in Russia [11]. Forty ore deposits and approximately fifteen hundred placer gold deposits have been identified here. In the latest years the greatest amounts of gold have been extracted from ore deposits, attributed to gold-quartz, gold-scheelite-quartz, gold-sulphide-quartz, gold-sulphide, gold-silver, gold-polymetallic and gold-copper-molybdenum-porphyry formations. They define not only metallogenic profile of the province, but also its placer-forming potential.

Gold-quartz formation combines deposits of the Priamur province with significant quartz ores, represented by quartz veins, zones of veined, veinlet-disseminated and metasomatic silification. Most deposits of this formation are located among terrigene, also known as «black-shale», series of Paleozoic and Mesozoic ages, less often among graphitiferous gneiss and crystalline schist of Pre-Cambrian age (Fig.1). Gold mineralizations are often associated with Mesozoic dikes of mixed composition, although genetic connection to specific magmatic formations is problematic. Content of sulphides in the ore does not exceed 5 %. Gold is mostly free, often with large particles till the size of nuggets. Due to the prevalence of free gold, the ores can easily be processed using simplest techniques. Sulphides are associted with only a minor fraction of gold, so they do not exercise any significant influence on the ore processing technology.

Vertical zonality of gold-quartz formation mineralization in the Priamur province is underexplored. Hence, in order to estimate level of deposit erosion we have used the scheme of vertical zonality for Central Kolyma province, in many aspects similar to the Priamur one [9]. This scheme has been developed using data obtained by P.F.Ivankin, who has distinguished frontal, central and near-bottom parts of the ore pipe [1].

The scheme is based on regular variations of gold-quartz deposit properties with depth: structure-morphologic types of ore bodies, content of ores and wallrock, gold-silver ratio in the ore, composition and gold-content of sulphides, typomorphic features of native gold and its purity, as well as homogenization temperature for gas-liquid inclusions in quartz [9]. The most characteristic element, defining attribution of gold-quartz mineralization to one of three parts of ore pipe, is purity of native gold, which is constantly decreasing with depth on the investigated deposits of Central Kolyma. Average grade of decreasing purity with depth approximates 16 ‰ for every 100 m. By convention it is considered that for near-bottom part of the ore pipe gold purity is less than 750 ‰, for middle part 750-850 ‰, for frontal one – 850-950 ‰ and higher (Fig.2).

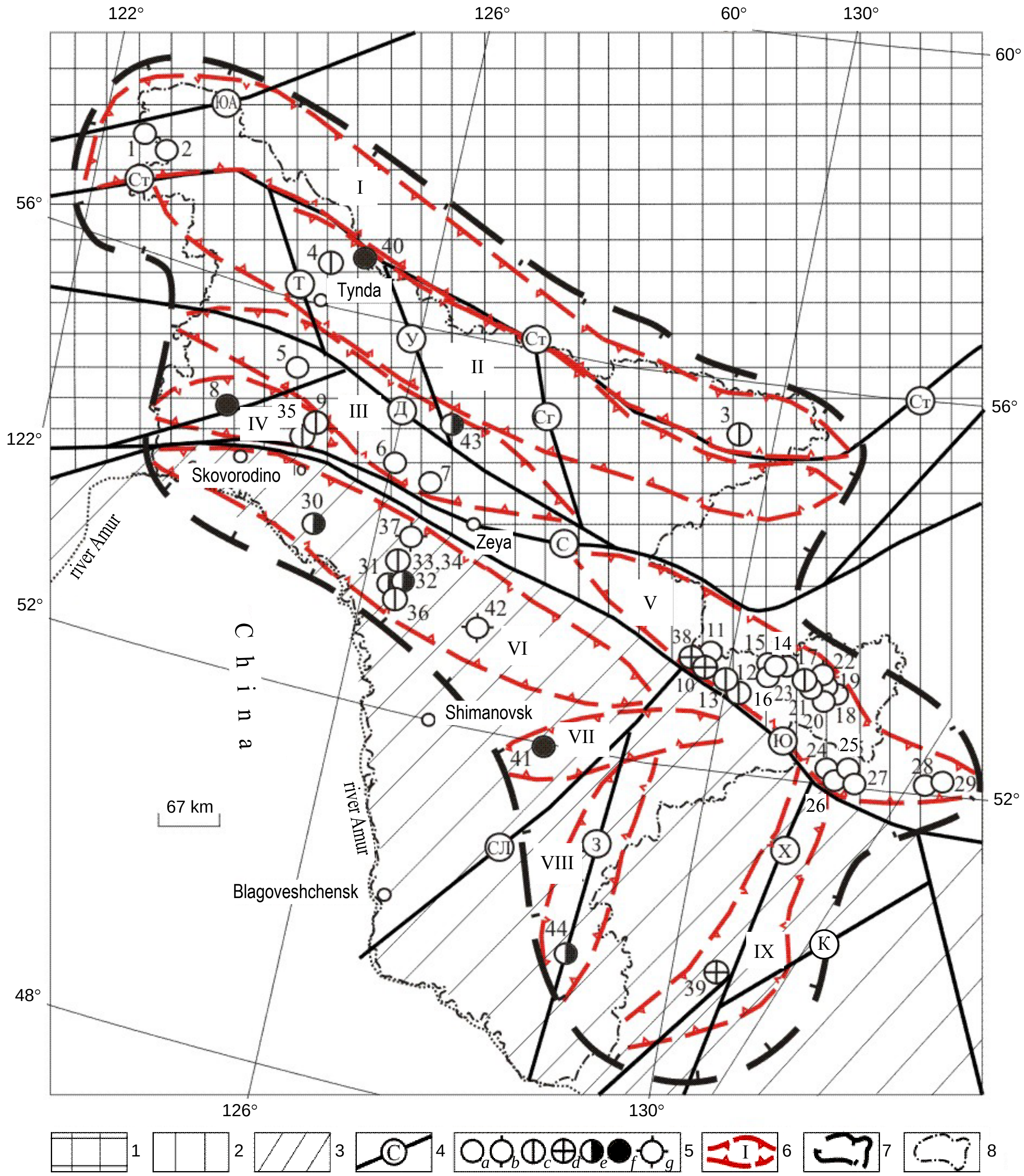

Fig.1. Gold deposits of the Priamur province

1-3 – geoblocks (1 – Aldano-Stanovoy, 2 – Mongolo-Okhotsky, 3 – Amursky); 4 – regional splits (ЮА – South-Aldansky, СТ –Stanovoy, Т – Tungurchansky, С – North-Tukuringsky, Д – Dzheltulaksky, У – Unakhinsky, Сг – Sugdzharsky, З – West-Turansky, СЛ – Selemdzhinsky, Х – Khingansky, К – Kursky); 5 – formations of gold deposits, their names and numbers: *a* – gold-quartz (1 – Ledyanoye, 2 – Skalistoye, 5 – Odolgo, 6 – Uspenovskoye, 7 – Zolotaya Gora, 11 – Kvartsytovoye, 14 – Tokyr, 15 – Innokentyevskoye, 16 – Sagur, 17 – Tarnakh, 18 – Albyn, 19 – Kharginskoye, 20 – Afanasyevskoye, 21 – Ingagli, 24 – Burovoye, 25 – Zhilnoye, 26 – Lysogorskoye, 27 – Petrovsko-Eleninskoye, 28 – Kerbinskoye, 29 – Tokolanskoye), *b* – gold-scheelite-quartz (22 – Unglichikan), *c* – gold-sulphide-quartz (3 – Kolchedanny Utes, 4 – Bamskoye, 9 – Kirovskoye, 12 – Voroshilovskoye, 13 – Verkhnemynskoye, 23 – Yasnoye, 33 – Pioner, 34 – Aleksandra, 35 – Solovyevskoye, 36 – Anatolyevskoye), *d* – gold-sulphide (10 – Malomyr, 38 – Osenneye, 39 – Noni), *e* – gold-silver (30 – Burinda, 31 – Pokrovskoye, 32 – Zheltunak, 43 – Ilichi Unakhinskiye, 44 – Prognoznoye), *f* – gold-polymetallic (8 – Berezitovoye, 40 – Mogotinskoye, 41 – Chagoyanskoye), *g* – gold-copper-molybdenum-porphyry (37 – Ikan, 42 – East Dvoynoye) formations; 6 – boundaries of metallogenic zones (I – South-Yakutskaya, II – North-Stanovaya, III –Dzheltulakskaya, IV – Yankanskaya, V – Dzhagdy – Selemdzhinskaya, VI – North-Bureinskaya, VII – Chagoyan-Byssinskaya, VIII – Turanskaya, IX – East-Bureinskaya); 7 – outline of Priamur province; 8 – borders of Amur oblast

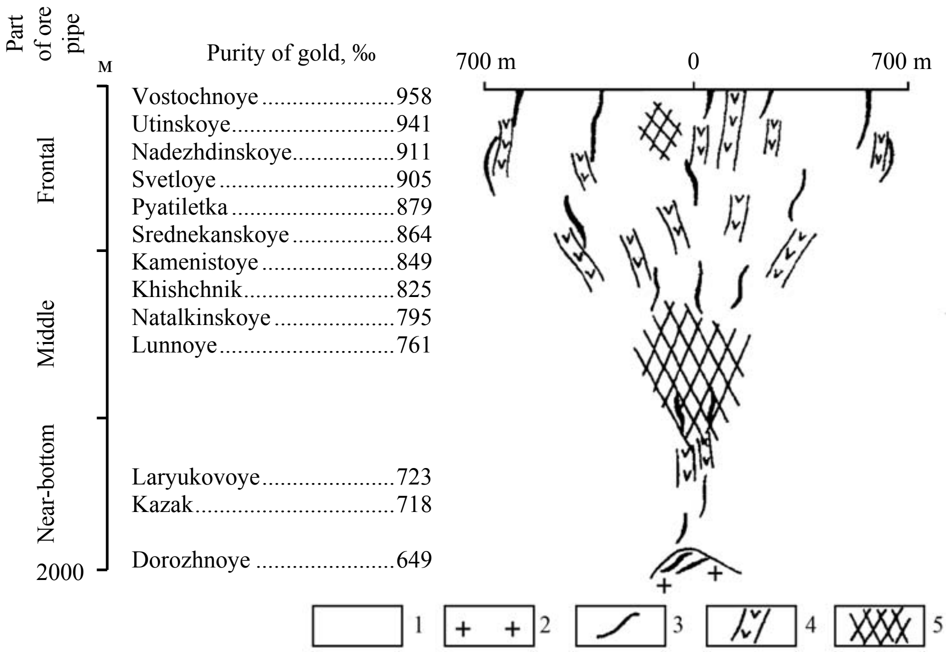

Fig.2. Model of vertical zonality of gold-quartz mineralization in Central Kolyma (according to [9])
1 – terrigene depths of Verkhoyansk complex; 2 – granitoids; 3 – quartz veins; 4 – mineralized dikes; 5 – veinlet-disseminated zones

Similarly to deposits of Central Kolyma, in Priamur province we have distinguished frontal, middle and near-bottom parts of the ore pipe for gold-quartz formation deposits (see Table).

The frontal part of the ore pipe contains 13 gold deposits of the province: Zolotaya Gora, Burovoye, Skalistoye, Petrovsko-Eleninskoye, Odolgo, Zhilnoye, Lysogorskoye, Tokolanskoye, Ledyanoye, Kerbinskoye, Uspenovskoye, Afanasyevskoye, Kharginskoye. They all are small-sized. Typical ones are Zolotaya Gora and Burovoye.

Deposit *Zolotaya Gora* is situated in Zolotogorsk ore-placer unit of Dzheltulaksk metallogenic zone, in Khugder riverhead [2]. It was discovered by artisan miners and was being developed from 1917 till 1949. 2 tonnes of gold have been extracted. Mineralization is located among the series of graphite-bearing biotite, two-mica gneiss and amphibolite. It coincides with the zone of diaphthoresis and silification of NW strike. The length of the zone is 3 km, thickness – 200 m. Gneiss and gold-bearing quartz veins are torn by late-Mesozoic dikes of microdiorite, granite-porphyry and syenite-porphyry (Fig.3). In the footwall the zone contains six strike and transverse veins of quartz, carbonate-quartz and quartz-feldspar, with thickness 0.3-0.6 m. The veins consist of glassy quartz, feldspar, include veinlets and lenses of calcite, inclusions of wallrock chipping. Surrounding rocks on the contact with the veins are seriatized, silificated and sulphidized. Pyrite prevails among ore minerals in the veins (5-15%), pyrrhotine, copper pyrite, galenite, molybdenite and gold are less common. Gold has fine and medium grain sizes, sometimes small nuggets can be found. The most frequent shapes are cloddy, tabular, tear-drop, dendrite, filamentary, octahedral with smooth angles and edges. Purity of gold is high (927-997 ‰, average after 15 tests – 965 ‰), trace elements include, g/t: Cu 740, Fe 150, Pb 6, Hg 3, Mn 11 [4].

Upper part of the deposit till depth 25-40 m is located in the zone of intensive oxidation. Oxidation products with rich gold have accumulated in empty spaces, forming lenses and pockets. This ochreous crumbling used to be the main object of mining. Large grains of gold and small nuggets (up to 1.5 kg) were extracted from ochreous nests. Apart from that, the richest areas of quartz and carbonate-quartz veins with visible gold were developed, sometimes also surrounding silificated diaphthorites. Higher concentrations of gold are confined to vein contacts with amphibolite and graphite-bearing gneiss. Gold content in oxidized ores reached 20 kg/t and even 60 kg/t. Gold content in initial ores – up to 4.9 g/t (vein № 4), maximum – 7.1 g/t (vein Shory).

Isotopic age of gold mineralization has been estimated using Rb-Sr-method in the laboratory of isotopic geology in Russian Geological Research Institute (VSEGEI) on the device MI-1201T. Analysis has been carried out on feldspar samples from the gold veins. The result was an obtained isochronous line with the age of 155±7 million years, which corresponds to transition between Kimmeridgian and Oxford stages of Upper-Jurassic period [10].

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Vertical zonality of gold-quartz formation deposits in the Priamur province

№	Deposit name	Purity of gold, average value in the brackets, ‰	Trace elements, g/t	References
		Frontal part of the ore pipe		
1	Zolotaya Gora	927-997 (965)	Cu 740, Fe 150, Sb 6, Hg 3, Mn 1	[4]
2	Burovoye	929-987, seldom 714		[6]
3	Skalistoye	952-962	Cu, Pb, Mo	[3]
4	Petrovsko-Eleninskoye	941-959 (951)		[2]
5	Odolgo	940-950		[2]
6	Zhilnoye	933-954 (943)		[2]
7	Lysogorskoye	930		[2]
8	Tokolanskoye	930 (872-966), placer gold		[2]
9	Ledyanoye	909-937		[3]
10	Kerbinskoye	917 (867-949), placer gold		[2]
11	Uspenovskoye	909 (862-936), placer gold		[2]
12	Afanasyevskoye	889-922 (907)	Hg 800, Fe 250, Cu 360, Sb 26, Te 190, As 95	[4]
13	Kharginskoye	850-910, seldom 610-636	Hg 3083, Pb 310, Te 200, As 164, Cu 131, Sb 47, Pt 1.2	[4, 8]
		Middle part of the ore pipe		
14	Albyn	760-912 (880-895)	Hg – up to 2.81 %, Cu – up to 0.051 %, Sb – tenths of a percent, Pb, Zn – tenths and hundredths of a percent	[8]
15	Tarnakh	797 (730-850), placer gold		[2]
16	Innokentyevskoye	785		[2]
17	Unglichikan	770 (663-980)		[2]
18	Kvartsitovoye	700-870 (778)	Hg – up to 3 %, Cu – up to 2 %, As – up to 1 %	[2]
19	Sagur	721-775 (754)	Hg 1110, Te 800, As 189, Pb 55, Cu 25, Pt 15	[4]
		Near-bottom part of the ore pipe		
20	Ingagli	715-750 (733)		[4]
21	Tokur	673-803 (726)	Hg 1503, Te 474, Pb 390, As 320, Sb 30, Pt 22	[4]

Note. For deposits Tokolanskoye, Kebinskoye, Uspenovskoye and Tarnakh gold purity is taken from the placer head, starting within the boundaries of the deposit area.

Deposit *Burovoye* is located in Sofiysky ore-placer unit of Dzhagdy-Selemdzhinsk metallogenic zone, on the left bank of Kanak river, left-bank tributary of Olga river, 3 km from Sofiysk settlement [2, 7]. It was discovered in 1899 in the course of placer mining on river Kunak. It was in the stage of development from 1899 till 1901, from 1914 till 1927 and from 1930 till 1932. Then the deposit was suspended due to low gold extraction rates. The area of the deposit is composed of

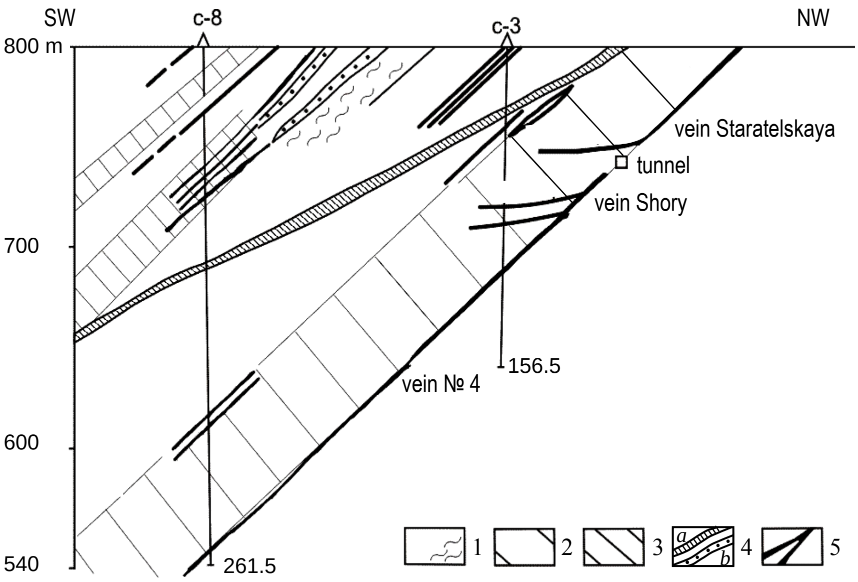

Fig.3. Section of deposit Zolotaya Gora (according to [2])

1 – biotite and two-mica gneiss with diaphthorite zones; 2 – members of interbedded gneiss and amphibolite; 3 – biotite-amphibole gneiss and amphibolite; 4 – dikes of microdiorite (*a*), granite-porphyry and syenite-porphyry (*b*); 5 – gold veins

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black graphitic phyllites, schistose sandstone, green epidote-chlorite and quartz-sericite slates of Olginskaya series, dating back to Lower-Cambrian (Fig.4). They have almost north-south strike with a 20-25° dip to the west. Slates are characterized by numerous bedded and transverse veins of quartz. Bedded veins contain a rare pyrite inclusion and have no practical importance. They are traversed by the main gold vein – Burovaya. Its thickness is 0.35-1.5 m, 0.7 m on the average. It is followed 820 m along the strike and developed to the depth of 60 m. Quartz in the vein has a massive, often breccia texture with traces of potassium feldspar (2-3 %), sericite (up to 1 %). Ore minerals in quartz include arsenopyrite (1-3 %), molybdenite, pyrite, gold, copper pyrite and galenite. Gold is fine, with mostly high purity values (929-987 ‰), inclusions of low purity gold (714 ‰) suggest that two mineral generations are involved. Gold content in the vein ranges from 8 to 106 g/t. Silver content reaches 21.7 g/t.

Isotopic age of the deposit, estimated using Rb-Sr-method on extracted potassium feldspar and sericite in the VSEGEI laboratory (analysis by Yu.P.Shergina), amounts to 65,3±5,3 million years, which corresponds to the transition from Maastrichtian to Danian stage [6]. According to exploration data from 1947-1948, gold reserves of vein Burovaya equal: in hard-processing ores – 1041 kg, in ores suitable for amalgamation – 534 kg.

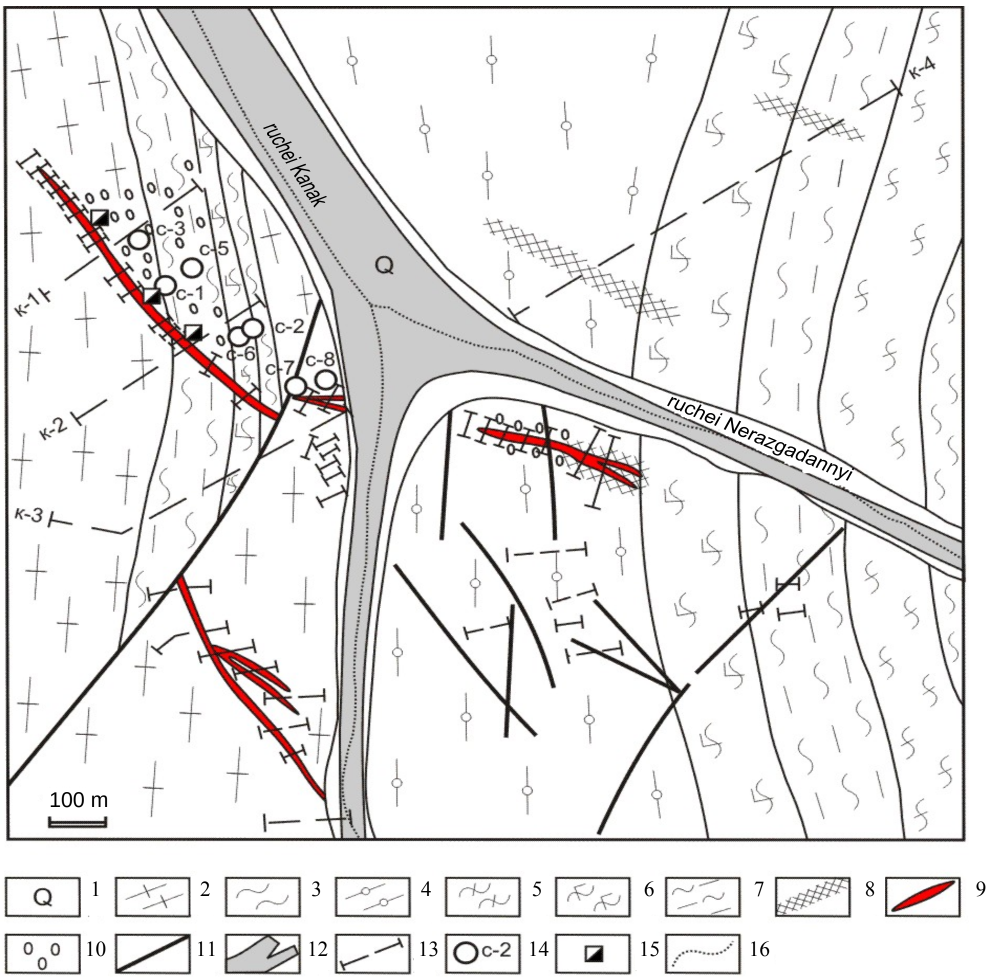

Fig.4. Burovoye deposit (according to [7])

1 – modern alluvial sediments (sands, gravels, cobbles); 2 – phyllitic carbon-bearing slates; 3 – green-grey chlorite-sericite-quartz slates; 4 – gray schistose sandstones; 5 – quartzite slates; 6 – green quartz-albite-chlorite slates and massive greenstone rocks; 7 – phyllitic carbon-bearing slates with interlayers of carbon-bearing meta-sandstones; 8 – matasomatic silification; 9 – quartz veins; 10 – veinlet-disseminated silification; 11 – splits; 12 – gold placers; 13 – trench lines; 14 – drilling wells and their numbers; 15 – inclines; 16 – streamflow

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The middle part of ore pipe contains five gold-quartz formation deposits: Albyn, Tarnakh, Innokentyevskoye, Kvartsytovoye and Sagur – and one gold-scheelite-quartz formation deposit (Unglichikan). Albyn and Kvartsytovoye deposits have intermediate amounts of reserves, others are small. The most characteristic of this part of the ore pipe is Albyn deposit.

Deposit *Albyn* is situated in Kharginsky ore-placer unit of Dzhagdy-Selemdzhinsk metallogenic zone, in the Albyn riverhead, south-east from Zlatoustovsk settlement. Surrounding beds are rocks of Afanasyevskaya suite, metamorphosed in greenschist facies and dating back to Early-Paleozoic age. They form Elkoganskaya dome structure, as well as subconcordant bodies of metabasites of Zlatoustovsky Late-Carbonic period complex. Along the slates and metabasites bodies of albite and chlorite-feldspar gold-bearing metasomatites are developed [5].

Gold-bearing zone of the deposit can be traced as a roughly east-west trending, arc-wise bended belt 5-6 km from Kharga river in the west through upper reaches of Albyn and Maristy brooks in the east. Its width in the western part is 350-700 m. Arc-wise zone distinctly coincides with Albynsky «plane» of greenstone-modified mafic metabasites, which are concordantly bedded between mica-quartz-albite slates of Afanasyevskaya suite. Ore bodies are located in mica-quartz-albite metasomatites (albitites), serving as zones of compression and fracture, oriented along the cleavage of rocks (Fig.5).

Ore bodies are represented by flat blanket, ribbon-like, lens-shaped leveled formations. The strike of separate ore bodies ranges from dozens to hundreds of meters and more. North-south oriented splits (Daykovy and Meridionalny) divide Albynskaya ore zone into three parts: western, central and eastern.

Major part of gold reserves of the deposit is located in the central part of Albynskaya gold-bearing zone. In the total reserve balance the share of ore bodies from the central part of Albynskaya

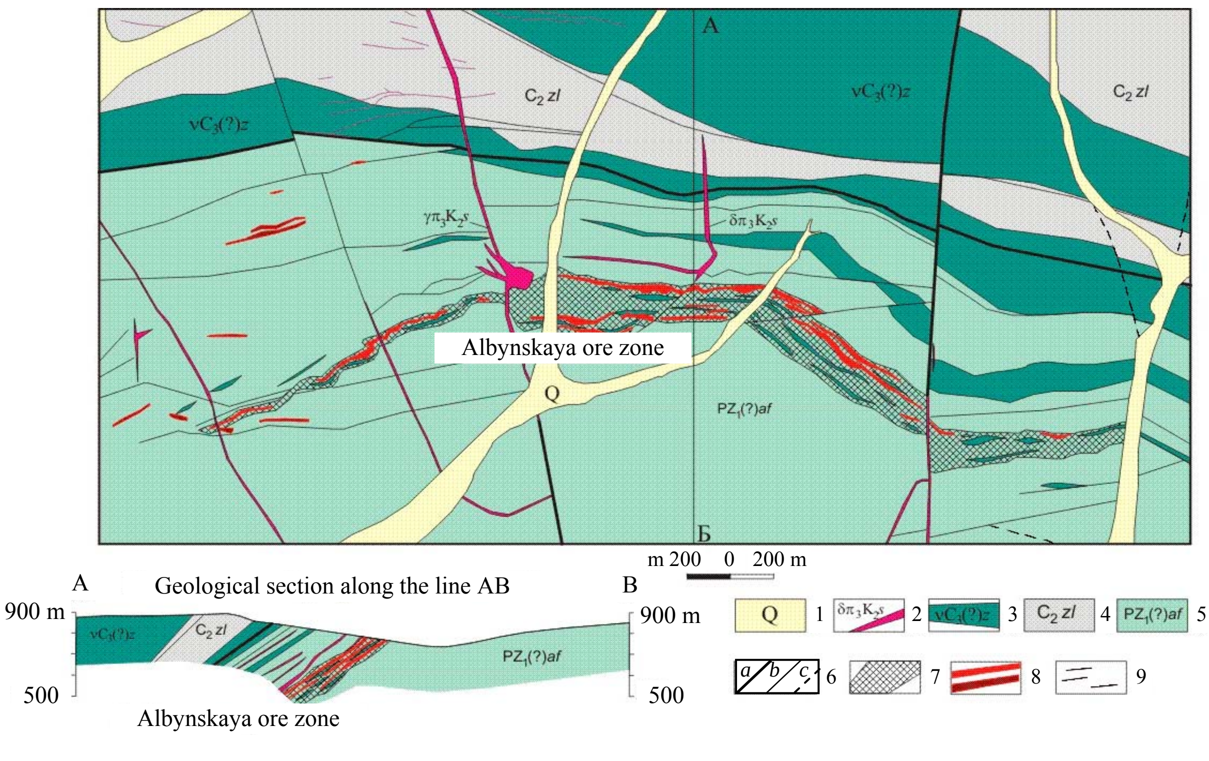

Fig.5. Geologic map of gold deposit Albyn (according to [5])

1 – alluvial sediments; 2 – Late-Cretaceous dikes of diorite-porphyry, granodiorite-porphyry, granite-porphyry of Selitkansky complex; 3 – gabbro, gabbro-diabase metamorphosed; 4 – Zlatoustavskaya suite (carbon-bearing quartz-sericite slates); 5 – Afanasyevskaya suite (muscovite-quartz-albite slates); 6 – splits: *a* – main, *b* – secondary, *c* – prognosed; 7 – albitite zone; 8 – gold bodies; 9 – gold-quartz veins

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zone amounts to 90-95 %, among them ore body № 1 takes up around 55 %. According to explorations, it is dipping to the depth of 390 m.

Western part of Albynskaya gold-bearing zone is separated from the central one by Daykovy split, cured with granite-porphyry dikes of Late-Cretaceous period. Here, within the boundaries of albitite formation, a ribbon-like ore body is distinguished. The share of western block of Albynskaya zone in the total reserve balance is approximately 5 %.

Eastern part of Albynskaya ore zone is offset from the central one along Meridionalny split by 130-140 m. The mineralization is poor, represented by two thin lens-shaped ore bodies. The share of eastern block in the total reserve balance is approximately 0.3 %.

In the section ore bodies of Albynskaya gold-bearing zone have simplified blanket or lens shapes, sometimes with flat smooth saddle, U-shaped and flexure bends. They are composed of mica-quartz-albite metasomatites with a network of veins and veinlets of various thickness (from filamentous to 5-10 cm).

The second, less frequent type of mineralization is represented by shatter zones localized in the western part of the deposit. Their strike is similar to the one of layered ore bodies of Albynskaya zone, but they have an opposite dip – south and south-south-east at an angle 25-50°. On the whole, 13 lens-shaped ore bodies of this type have been identified, most of them coming to the surface. Mineralized shatter zones contain chipping of gold-bearing venous quartz, as well as fine guartz-sulphide veinlets, overlapping shattered material. Mineralization is accompanied by beresitization. Gold-bearing shatter zones transverse ore bodies of the first type, sometimes setting them off, i.e. they belong to later periods. Mineralization parameters (thickness, gold content) are similar to ore bodies of Albynskaya zone, but with distinctively smaller depth and lateral length.

Ores of Albyn deposit are by 95-98 % composed of quartz and feldspar, as well as mica minerals, mostly muscovite and sericite [8]. They are represented by quartz-feldspar, carbonate-mica-quartz-albite, carbonate-chlorite-mica-quartz-albite, mica-quartz-albite metasomatites and mineralized shatter zones.

Prevailing ore minerals are sulphides – pyrite and arsenopyrite. Other minerals can only be detected in separate grains. Total share of sulphides does not exceed 2 %. Early (pre-ore) minerals include magnesite, hematite, early generations of pyrrhotine and pyrite. Minerals, directly associated with gold, contain arsenopyrite, pyrite, pyrrhotine, copper pyrite, sphalerite and galenite, localized in veins and veinlets. According to atomic absorption analysis, content of gold in sulphides varies from 10.2 to 125 g/t, in ferric hydroxides it reaches 11.3 g/t [8].

Shapes of gold nuggets are irregular, tabular, veinlike-tabular, wirelike and oblate, less often – crystalline. Significant amounts of gold (27-47 %) have grain size +0.074 mm. Quite often gold bigger than 1 mm can be detected. Share of fine gold (3-25 μm) ranges from 8 to 40 %. This gold is generally well retrieved by cyanidation. A significant fraction of gold is dispersed through iron and iron-manganese carbonates, which together with arsenopyrite fill the veinlets in quartz and sericite-quartz-carbonate aggregate. Sometimes gold can be traced in arsenopyrite fractures. Share of refractory gold for different ore types amounts to 0.7-13.4 %. Apparently, it is early finely-dispersed gold (< 0,001 mm), closely associated with sulphides.

Purity of gold from Albyn deposit varies from 760 to 912 ‰. The most frequently observed value is 880-895 ‰. Less often can gold with purity of 865-880 and 895-910 ‰ be detected, even less often – 850-865 and 835-850 ‰. Gold of 760-790 ‰ is the rarest. Average value across 210 samples is 885.2 ‰. The most common trace element is mercury (up to 2.81 % of the mass), less frequently observed are copper and antimony [8].

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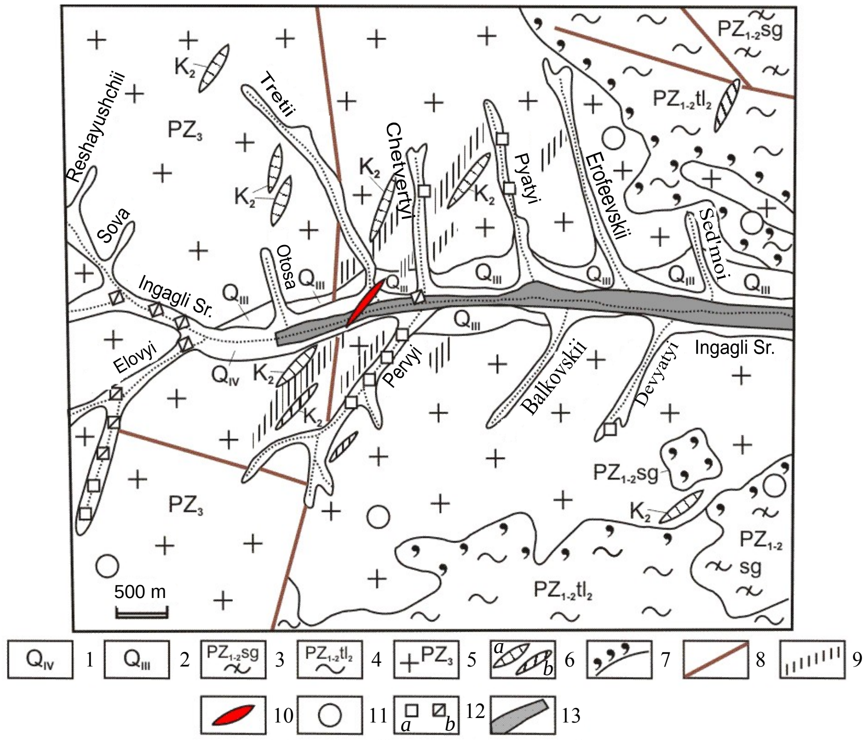

Fig.6. Gold deposit Ingagli (according to [2])

1 – modern alluvial sediments; 2 – Mid-Quaternary alluvial terrace sediments; 3 – clay slates, aleurolites, sandstones, limestones of Sagurskaya suite, Early and Middle Paleozoic; 4 – sandstones, clay slates, aleurolites of Talyminskaya suite, Early-Middle Paleozoic; 5 – plagiogranites, granodiorites of Ingaglinsky massive, Late Paleozoic; 6 – Late Cretaceous dikes: *a* – quartz diorites, *b* – diorite porphyry; 7 – contact hornfels; 8 – splits; 9 – silification zones; 10 – quartz vein; 11 – points of gold mineralization; 12 – stream sediment samples with gold content: *a* – below 100 mg/m^3, *b* – above 100 mg/m^3; 13 – gold placer

Ores of the deposit can be classified into oxidized, mixed (different grades of oxidation) and primary ones. The latter ones distinctively prevail in the formation. The share of free gold in primary, mixed and oxidized ores of Albyn deposit is generally high (79.3-91.1), significant parts of it are intergrown (8.6-18.4 %), refractory gold accounts for 0.3-3.9 %. Mixed ores are an exception, as they are characterized by high content of sulphides. The share of free gold in them is 14.4 %, intergrowth accounts for 72.2 %, refractory gold associated with sulphides reaches 13.4 %. Despite various grades of oxidation (from 4 to 93 %), they all can be attributed to a single technological type of easily-cyanidated ores. Share of gold, suitable for cyanidation, varies from 87 to 99 %; amounts of free metal, suitable for amalgamation, in most cases equal 79-91 %. Ores from upper planes have the same technologic properties as the ones of deeper bedding.

In 1940s quartz veins of the deposit produced around 690 kg of gold, lenses of gold-bearing metasomatites – 100.5 kg. Total amount is 790.5 kg. Gold content decreased with depth. Since 2011 a pilot open quarry is operating in order to retrieve residual gold; in 2012 the production amounted to 2648.1 kg of gold. Taking into account earlier developments, cumulative production from the deposit is 3357.6 kg.

Near-bottom part of the ore pipe includes a middle-sized Tokur and a small Ingagli deposits. The most typical deposit for the near-bottom part is Ingagli. Tokur is attributed to this part of the ore pipe by convention, but its attribution to the middle part is also not excluded.

Deposit *Ingagli* is situated within Kharginsky ore-placer unit of Dzhagdy-Selemdzhinsk zone, on the left side of Sredniye Ingagli river valley [2]. It was discovered in 1934 by artisan miners. In 1934-1938 the deposit was explored and simultaneously developed, 220 kg of gold were extracted. The deposit is located among Ingaglinsky block of granitoids, dating back to Late-Permian period (Fig.6).

The block contains echelon lens-shaped quartz veins 1.5-2.0 m in thickness, as well as zones of veinlet silification. Zones have been traced 60 m along the strike, 20 m into the dip. Gold mineralization is accompanied by the dikes of quartz diorites and diorite porphyry of Late-Cretaceous age. Wallrock alterations are represented by silification and sericitization. Ore minerals include: gold,

DOI: 10.18454/PMI.2017.1.20

arsenopyrite, galenite, sphalerite and pyrite. Gold content varies from 14-22 to 100 g/t. Average purity of gold is low – 733 ‰ (612-750 ‰). Provided that the depth of predicted mineralization is 100 m, predicted resources of the deposit (category P_1) amount to 1.5 t of gold.

Conclusions

Distinguishing certain parts of the ore pipe of gold-quartz mineralization in the Priamur province, as it has been done earlier for Central Kolyma, allowed to come to the following conclusions. Frontal part of the ore pipe contains the major part of gold-quartz formation deposits of the province. They are small and generally are represented by scattered quartz, feldspar-quartz and carbonate-quartz veins. Ores in the deposits of this part of the ore pipe are characterized by erratic gold content, bonanzas can be found. Gold in the ores is mostly free, ranging from fine to big grains and small nuggets. It is associated with arsenopyrite, galenite, pyrite, sometimes with antimonite (deposits Petrovsko-Eleninskoye and Afanasyevskoye). Among trace elements, apart from prevailing silver, can also be copper, mercury, antimony and arsenic. Content of mercury in native gold of Afanasyevskoye and Kharginskoye deposits reaches tenths and units of percent. Prevalence of frontal part deposits in the province leads to numerous placers and points to significant prospects of finding a rich deep mineralization in the middle part of ore pipe.

Middle part of the ore pipe contains intermediate (Kvartsytovoye, Albyn) and small (Innokentyevskoye, Sagur and Unglichikan) deposits. Ore bodies are often represented by veined and veinlet-disseminated zones, sometimes zones of metasomatites (Albyn). For gold-quartz ores, free native gold can commonly be found, usually of fine and very fine grain size. Among ore minerals, apart from arsenopyrite, pyrite and galenite, scheelite is frequently observed. Sometimes scheelite content is high enough for the reserves to become marketable (deposit Unglichikan). It is worth mentioning that high content of scheelite is also characteristic of a unique deposit Natalka, situated in the Central Kolyma province.

Deposits of near-bottom part of the ore pipe are quite rare. Ore bodies are represented by quartz veins and zones of metasomatites. Gold is mostly free, of fine and super fine grain size. The prevailing trace element is mercury. For deposit Ingagli surrounding beds are a granite block. It resembles Dorozhnoye deposit in the Central Kolyma province, a typical example of near-bottom part deposit.

Attribution of gold-quartz deposits to a certain part of ore pipe can facilitate more precise estimation of their prospects. In its own turn, this will allow to choose more favorable objects for further evaluation.

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The paper was accepted for publication on 6 September, *2016.*