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Research Article

UPPER PALEOZOIC MAGMATISM: GEOLOGICAL GENETIC MODEL OF EPIMAGMATOGENE MINERALIZATION (CHATKAL-KURAMA ZONE)

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ABSTRACT
At early stages of the Upper Paleozoic magmatism development, the «basaltic» melts form chlorophylic-chalcophylic types (Cu, Mo, Au, Pt, Pd) of epimagmatogene mineralization. Chlorophylic-chalcophylic mineralization is interchanged to fluorophylous (hydroxylic)-lithophylous type of mineralization (rare metals, rare earths, yttrium, uranium). Interacting of magmatism with a material of ancient (to Cm) continental type crust is an important result of the Upper Paleozoic and Early Mesozoic processes of magmatism and associated types of epimagmatogene mineralization development.

Keywords: *Magmatism, Crust-Pallial Plum, Accessory Minerals, Mineralization, Ore Magmatic Concentrates*

INTRODUCTION
On upper Paleozoic and Early Mesozoic era of sub-oceanic crust Chatkal-Kurama area was in a state of activation (the impact of abnormally heated (Borisov, 1988) crust-mantle plumes (Dalimov, 2003; Kozlowski, 2006)), formed magmatogene (C_1 to C_3-P_1 and P) and epimagmatogennye - Cu (Mo) -Au porphyry (Big Kalmakyr, Suyuksu, Kelenchek-Tashkesken, Djilandy etc.), epithermal gold-silver (Kochbulak, Kayragach, Kyzylalmasay, Chadak, Revashte etc.), silver-containing (Lashkerek, Kenkol, Lashkerek et al.), skarn-iron (Surenata, Ihnach, Shabrez), skarn-gold-copper ore (Bozymchak, Gavasay, Kurutegerek), quartz-fluorite (Suppatash, Naugarzan, Agata-Chibargata) derivatives.

Upper Paleozoic Magmatism, Epimagmatogene Ore Derivatives

Geological genetic model of upper Paleozoic magmatism (Figure 1-3) and epimagmatogenic derivatives - are predominantly epithermal silver-goldsilver deposits (Yusupov, 2015) metal content (Au, Pt, Pd, Cu, Pb, Zn, Bi, etc.) area production (ore content) and associated magmatism epimagmatogenic returns. The development of the crust-mantle plume and the associated "basaltic" melt (processing "upper mantle wedge" (Dalimov, 2003) determined by the composition of Upper magmatic complexes (formations), their derivatives epimagmatogenic.

Geological genetic model of magmatism (upper Paleozoic, Mesozoic early) covers the formation of rocks magmacomplex epimagmatogenic ore derivatives magmatism (Figure 1-3) mantle peridotites undergoing "metamagmatogennic" processing (carbonation) deep fluids in equilibrium with the process fluid mass transfer with the participation of carbon dioxide (high density) changes due to the additional enrichment, the primary water. The compositions of gases (Yusupov, 1994) Natural (accessory) minerals Upper volcanoplutonic complexes - nitrogen hydride (N_2-CH_4; C_2H_2, etc.). For oxidizing the presence of CO_2. Primary fluids from the H_2-He and CN, when practicing mantle geothermal conditions enriched in CO, CO_2, N_2, H_2O, and others. The primary baro thermophilic and high density fluids from the CO_2 formed mainly of calcium carbonate (Yusupov, 1983), tonsils dyke is filled, etc. rock, as well as separate bodies (mantle xenoliths, deep inclusions, etc.). Their isotopic compositions (Yusupov, 1983) - depth (from minus 3.9 to -8 ‰ δC^{13}).

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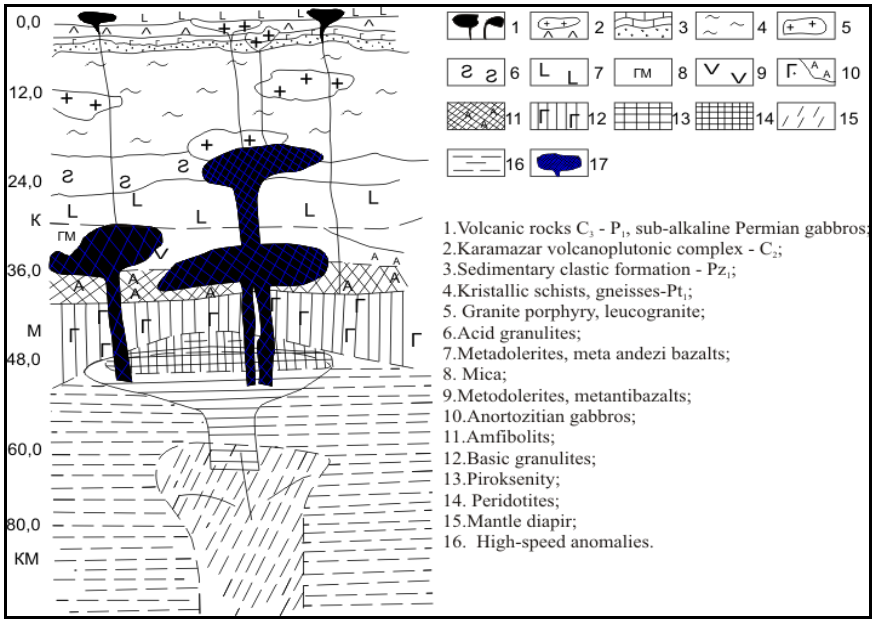

Figure 1: The Basic Model of Magmatism "Hot Spots", "Underlying Processes," the Location of Ore-Generating Chambers (for Dalimov T.N. *et al.*, 2003; Babayev K.L, 1983 with additions Igamberdiev E.E)

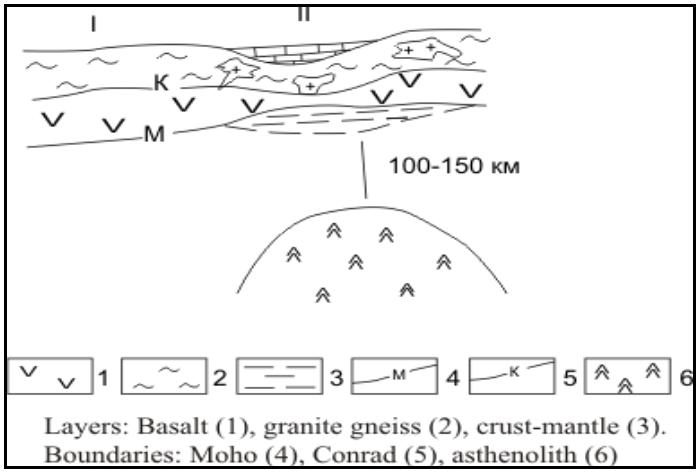

Figure 2: Model Pulsating Cortical Development Chatkal-Kurama Region, I - Kurama Zone; II – Chatkal Zone

Rjabchikov (1982) in some parts of the upper mantle does not exclude the presence of water (water and carbon dioxide) as the equilibrium of fluids with mantle melts. The introduction of the mantle substrate constructed coolant - mainly high magnesial and deeper melts followed by their partial melting.

Lamproite rocks (Koshmansay diatreme, K_1 is) contain unsorted by size fragments of carbonate rocks, borrowed from the surrounding limestone (D_3-C_1), and volcanogenic complexes plutonogenic (C_1 to C_3-P_1 and P_1), including hornfels, quartzites, shale and other education (Pt_1), as well as the acid mantle-crust light pink fine-grained banded granulites (quartz, orthoclase, garnet, etc.). Gabbro (Shavaz complex, C_1) contain deep inclusions, among which there are alkaline pyroxenite of titanomagnetite, aegerine-augite (basic crystalline-grained rock mass), against which is larger in size (10 cm) porphyroblasts – long prismatic crystals aegerine-augite; rock contains "unnamed" grenades (barium-titanium, TiO_2 29, 68, Ba 12, 66 wt.%).

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Figure 3: Ore-Magmatic Concerts Chatkal-Kurama Region (Borisov) with Additions Igamberdiev E.E

1. Ore Objects Associated with Deep Intrusions (Hypo Depth) of the Genesis; 2. Copper Ore with Associated Intrusions Monzodiorite - Granodiorite (Crust-Mantle, Moderately Deep with) of the Composition; 3. Poly Metallic Ore Objects with the Transition to the Periphery to Mineralisation, Connected Granites with Crustal Genesis (Shallow Crustal)

Calc-alkaline magmatism series (K≥Na) (Dalimov, 2003; Dalimov, 1982) - a product of crystallization differentiation "high-aluminum" basalts, is directly related to the active centers of magma. Upper magmatism - a rock peridotite-gabbro-anorthosite, C_1 (shavaz complex) and trachybasalt-trachyte (Uia volcanic complex derivatives); gabbro-monzodiorite-granodiorite, C_2 (Karamazar complex) with trachybasalt-trachyandesite-trahidatsit (Minbulak complex S_{2mb}) and trachyandesite-dacite (Akcha-nadak complex $C_{2\text{-}3ak\text{-}nd}$ komagmatits); granite leykogranit, P_1 (Arashan complex P_1) - rhyolite-trachyrhyolites (Oyasay-kyzylnura volcanogenic complex, $P_{1os\text{-}kn}$) complexes.

Geodynamics, Magmatism and Mineralization

The crust Chatkal-Kurama zone (capacity of 35 to 50 km), in addition to granulite-eclogite ("basalt") and granite-gneiss structure fragments consists of Archean-lower Proterozoic base riphean and Paleozoic cover with the "granite" and others (Mesozoic - and Cenozoic) magmatic structures. Ore magmatic type of the Earth's crust - sialic - femic. The crust has an increased capacity of "basaltic" layer (20-25 km) and the nature of the spread of vulgar Upper igneous rocks, as well as relatively high magnetic susceptibility, increased "iron content" rocks Upper Paleozoic magmatism (1.5 times higher than the clarke Fe) (by Khamrabaev, 1969). In igneous rocks has been an increase of accessory - magnetite (titanomagnetite) and other iron (sidero-) native metal ore (Cu, Mo, Au, Pd, Pt, etc.). And non-metallic (apatite, fluorite, and others) minerals.

In the early (C_1, C_2, C_3) stages of the geodynamic setting Chatkal-Kurama crust-mantle plume controls the formation of high-alumina basalts (derivatives interaction mantle melts with substance sialic crust), occurs study highly metalliferous (Au, Cu, Pt, Pd, etc.). Archean-Proterozoic gneisses, schists, quartzites, marbles, metabasite (mafic-ultramafic, basic and others rocks). Basaltic melt, interacting with the continental crust (Dalimov, 2003; Rafikov, 2012) forms a nearly complete set of Paleozoic magmatic complexes. Trend evolution magmatizma- subalkalic (monzonite). Geodynamics (C_1 to C_3-P and P_1) of Chatkal-Kurama crust-mantle plume (activation, the situation decompression melting of the mantle substrate), forming epimagmatogenic derivatives (from chlorophyll-chalcophilic towards ftorofilno-lithophilic) is considered as a factor epimagmatogenic metal content (Figure 3) with the "ore-magmatic" (Chatkal-Ugam-Pskem, Kurama-Karamazar, Mogoltau etc.) concentration.

Fergana structural and tectonic construction (C_1-P) include Chatkal and Kurama arched (child) structure (Borisov, 1988; Thompson, 1985). According Ugam zones (Kumbel) -Kenkol-Arashan deep faults Chatkal vault is divided by Kurama. Products trachybasalt-trachyandesite high-explosives (S_{2mb})

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magmatism formed accumulate in the system and narrow grabens sublatitudinal (Angren, Terekli, etc.). Chatkal vault space is made up of rocks volcanic-plutonic complex, C_2 (karamazar, Kurama) and late granite leucogranite (Arashan complex, P_1) and syenite-diorite (babayob, chilten and other complexes, P_1). Borderland Chatkal and Kurama vaults - Chatkal-Ugam-Pskem ore-magmatic conc, metallogenic feature of which - copper (molybdenum, gold) - porphyry (Kelenchek Tashkesken-ore field), bismuth-tellurium-copper (Tashkesken, and Terekli etc.), silver-polymetallic (Kumishkan, Koshmansay etc.), skarn-scheelite and skarn-magnetite, gold ore silver (Kyzylalmasay, Samarchuk, Revashte, etc.), rare metal, rare-earth (Kelenchek-Tashsay ore field, Barkrak, Sargardon et al.).

Central (dome) basis Kurama vault (high permeability zone) is composed of igneous rocks enhance the core (mafic, and ultramafic, C_1), edge finished construction - subalkalic (potassium-sodium) moderately acidic (monzodiorites, diorite, granosyenites etc. C_2). Rock types controls the ore fields (see figure 2) (Borisov, 1988), placing gold-silver, gold-copper-ore and silver mineralization types. Activation of a mantle plume, C_1 and "hot spots mantle" contaminates the substrate sialic crust ("anatexis"), forms the "granitetes melt" and epimagmatogenic derivatives (precious and non-ferrous metals, collections of rare metals, rare earth, yttrium, uranium, etc.).

Subduction, collision and intraplate magmatism Upper Paleozoic- and Early Mesozoic meta and control epimagmatogen derived magmatism, metal contents in the area Au, Cu, Mo, Bi, Pt, Pd, etc., Rare metals, rare earths and other strategic (Fe, Mn, Ti, diamonds, apatite, and others.) minerals.

PGE mineralization is segregated on the actual platinoid (mafic-ultramafic, Shavaz complex C_1 and granitoids, Karamazar complex, C_2), and the platinum-complex (contact-pneumatolytic, hydrothermal, plutonic, volcanic and others) types of mineralization. Useful components: platinum metals (the total number of "light" platinum prevails over "heavy").

Subduction, C_1 (sintectonic-batolite) geodynamic stage (Dalimov, 2003) development of the territory allocated calc-alkaline ($K \geq Na$) development of magmatism. Epimagmatogenic derivatives (Fe-Ti, Fe-Ti-P, Fe (Cu) -S, etc.) on the mineralogical and geochemical types (magnetite, titanomagnetite, apatite, pyrite, chalcopyrite and others), except for Fe and chlorophyll-related chalcophilic (Cr, Ni, Co, V, Au, Ag, platinum metals, As, Hg, and others) sets of elements (Yusupov, 2014) metalliferous on apatite-magnetite (Aktepa, Akcha-Shavaz, Belyauty) types of mineralization (Fe, Ti , V, Co, Ni, PM). They practically significant amounts (from 0.1 to 1.0 g / t) are present "unconventional" platinum metals (Pd, Rh ...). With apatite iron ore in practically significant amounts of interest on rare earths, yttrium (REE + Y), and others.

Gabbro-peridotite-anorthositic (Shavaz complex, a C_1) (Rafikov, 2012; Rafikov and Yusupov, 2012) with pyrite-chalcopyrite; magnetite (titanomagnetite) and accessory apatite-mineral (metamagmatogenic) formulations (Aktepa) - a commercially promising in the apatite-magnetite (Yusupov, 2014) types of mineralization. Gabbro of the Shavaz complex with their "ferrogabbro" productivity control Fe, Cu, Pt, Pd - nye types of mineralization.

Collision C_2 to C_3-P_1 (village tectonic) magmatism is represented mainly plutonic derivatives allocated "water saturation" compositions. Volcanic comagmates magmatism (trachyandesite-dacite, trachybasalt-trachyandesite-trahidatsite) presented a complex of differentiated rock associations. Pegmatites derivatives moderately acidic granite are characterized by significant apatite (Kyzyltashsay the Angren plateau). In conjunction with pegmatites ore fence apatite (Yusupov, 1983) in practically meaningful quantities present sphene, ilmenite, orthite and disseminated REE + Y (monazite, fergusonite, chevkinite) minerals.

Symmetric-zonal (apatite-rare) pegmatites contain an abundance of microcline, biotite and biotite-hornblende intergrowths (quartz core, selvage). The pegmatites are present minerals, rare metals, rare earths and yttrium, zirconium (orthite, sphene, fergusonite, apatite, zircon, etc..). Metal content, which is primarily characterized in the rare metals and rare earths. Ore fence e minerals (ilmenite, sphene, apatite, orthite), interspersed (orthite, gadolinium, fergusonite, monazite, zircon, Orange, tsirtolit, chevkenit) it - minerals (media) rare (Nb) elements, of REE and yttrium. Other quartz-feldspar-Sherlov types of pegmatites with orthite and quartz-feldspar-axinite and bastnasite (Belyauty, Akcha-Shavaz, Iertash) and

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further characterized by (native bismuth, molybdenite, chalcopyrite and others) load (rare and non-ferrous metals).

Contact-pneumatolytic (skarn) epimagmatogenic types of mineralization occur on the active contacts of intrusions of gabbro-mantsodiorit-granodiorite, C_2 (Karamazar) complex with limestone (dolomite), D_3-C_1. Skarn copper gold (Gavasay), skarn polymetallic (Kurgashinkan, Kumishkan, Altyntopkan etc.), Skarn iron (Syurenata) and bismuth (Chokadambulak), bismuth, arsenic (Ustarasay, Bruchmulla, Kulma, Tomchi, Uchkap) mineralization - carriers Au, Ag and platinum metals. Postskarn hydrothermalites sulfides (Pb, Zn, Cd, Re, Bi et al.). To contain significant quantities of virtually free gold, platinum metals (Pt, Pd) and others. Skarns (gold-copper, gold-arsenic, arsenic-copper-gold, gold-arsenic-telluride-gold, copper-platinum, gold-tungsten ore) - epimagmatogen derivatives, forming intervals - geophase 800-400^{0}C (Babaev, 1978; Holmatov 2015).

Upper hydrothermal (epimagmatogen) type mineralization belongs: 1) copper gold-porphyry (interspersed-vein); quartz-chalcopyrite with gold (Big Kalmakyr, Kelenchek-Tashkesken, Djilandy, Suyuksu); 2) quartz-silver-polymetallic (vein); pyrite-polymetallic (Lashkerek Kenkol, Agrankul.); 3) quartz-sulfide gold ore; quartz-gold ore (Kochbulak, Akturpak); 4) quartz-fluorite, fluorite-barite; barite-fluorite galena with; quartz-fluorite-bismuth; uranium ore sulfide, calcite-ankerite- uranium (Agata-Chibargata, Naugarzan, Suppotosh) derived magmatism.

Epimagmatogen derivatives leykogranite granite magmatism, P_1 (Arashan, charkasar, bedanalisay complexes) - ftorium-lithophilic geochemical types of mineralization (Nb, Ta, Be, Sn, W et al.). Accessory-mineral mineralization - monazite rare metal-fluorite with - and rare specialization on land-Ce (La, Pr, Nd, etc.) and U, Th (Kelenchek Tashsay-ore field). Products (Be, Nb, Sn, Zr, REE + Y, U, Th) metamagmatogene (post magmatogenic) processing granite leucogranite (albitized apogranity, pegmatites, actually albitites, greisen and hydrothermalites) - resource potential (prospects) for rare earths, yttrium, thorium and uranium.

Ore field (Kelenchek-Tashsay) albitites, genetically related to granite-leucogranites P_1 media extremely scarce Ti, Nb, Ta (rutile contain up to 2% Nb_2O_5; ilmenorutily - 22, 46% Nb_2O_5), promising to associated refinement - accessories monazite, torit-oranzhity, cyrtholites, fergusonity, gadolinite etc. Ore field (Charkasar I, II; Rizak, Alatanga, Beljak, Kattasay, Tashsay, Kelenchek et al.). Granite- leucogranites (Arashan, Charkasar, Bedanalisay complexes P_1) - epimagmatogennye derivatives (cyrtholites, thorium-oranzhity, monazite, fergusonity, gadolinite etc.) magmatism in the strategic (Nb, Ta, Be, REE + Y, uranium, thorium), and other minerals.

Greisen mica-quartz (topaz fluorite, scheelite, wolframite native bismuth, tourmaline, feldspar, etc.) - Epimagmatogene derivatives granite-leucogranite, P_1 (Arashan, Charkasar, Sargardon complexes and others.).

In the long term interest of cassiterite-mica-quartz (Chapankyuydy and Bedanali the Angren plateau), quartz-topaz-muscovite (native bismuth, Gyubnera, scheelite, Jose and cassiterite, Tashsay), quartz-tourmaline (native bismuth; Kenkol, Tashsay), wolframite -molibdenit quartz and scheelite-molybdenite-quartz (Karakiz) greisen on Sn, W, Bi, etc. quartz-tourmaline greisen (native Bi) - veined body (from 0.15 to 1.5-2 m thick), length 100 -200 m. greisens contains fluorite, sericite, topaz, Shirley pyrite, pyrhotite, Bi minerals, the W, Bi and others greisen vein metasomatic (Tashsay), as well as quartz-tourmaline (vein type) with native Bi (up to 5.0 m thick or more, at considerable length) by 70% consist of schorl (sometimes, there are signs of native Au), scheelite, and others with granite leucogranites (Arashan complex, P_1) associated quartz-cassiterite, quartz-turmalin- cassiterite, quartz-tourmaline-scheelite mineralization types.

Potassium intraplate alkali basalts, K_1 (lamproites, lamproitopodobnye education, etc., Koshmansay, Terekli, etc...) – these products of mantle magmatism, anomalously enriched in potassium, titanium, gold, platinum metals (aktsessories-native form, alloys, intermetallic compounds) and related ferrite complex hromferrita, native metals (chromium, nickel, etc.), non-metals (diamonds, graphite) are present silicides (mavlyanovite, suess etc.), carbides of metals and nonmetals (khamrabaevite, moissanite et al.), based phosphides Fe, Mn, and others.

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RESULTS AND DISCUSSION

Discussion Materials Research

Accessory mineral (apatite-magnetite; Aktepa) types of mineralization (Yusupov, 1983; Yusupov, 2014) with sets of native Au, platinum group metals, accessory apatite, fluorite, as well as rock-forming biotite and amphibole - carriers meaningful content REE + Y, Ce + Y. The apatite, biotite, etc. Characteristic chlorine impurities (chlorophyll-chalcophilic metal content). Magnetite sub-alkaline and alkaline rocks (trachyandesite-trachybasalt, gabbro-monzonite-syenite, Babayob complex, P1) contain TiO_2 - an indicator of their formation type.

The rocks are also present in nuggets accessory minerals (ferrite-α-Fe, intermetallic nuggets - Sn + Sb, Sn, Pb, Pb + Sn + Tl, Pb + Sn; Zn, Cu, Au, Pd, Rh, etc.). Metamagmatogene (epimagmatogene) derivatives inherits nugget (Au, Cu, platinum metals and others) mineralization. Cohen-ferrite iotsitovye mineral parageneses moissanite - conditions indicators (ionized hydrogen in the inclusions of minerals, hydrocarbons, nitrogen and other mantle fluids) of their formation. Residual melt (metamagmatogene) enriched Au, Ag, Pd, Rh, Pt, Cu, Pb, Zn and others. Transformed into compounds bound mineralization. Upper continental plutonism and associated volcanism (C_1, C_{2-3}, P_1), combined with gibridism processes (assimilation) form the early stages of derivatives - chlorophyll-chalcophilic (Au, Cu, Mo, Pt, Pd, and others) and later -ftorofilic-lithophile (Sn, W, Nb, Ta, REE + Y, U, Th, and others) types associated mineralization.

Geological genetic model of magmatism (Figure 1-3) and endogenous types of mineralization is based on a group of factors that determine the sources of useful components of their mobilization and formation epimagmatogene ore derivatives (metamagmatogene, pneumatic-metasomatic, hydrothermal genotypes). Evolution of the Upper (C_1 to C_3-P and P_1) of the crust-mantle plume and ore epimagmatogene derivatives, accommodation, mainly epithermal gold-silver and silver deposits - the originality of the mineralogical and geochemical characteristics of the ore process on Au (Ag), Bi, Sn, Cu, Pt, Pd, Rh, etc.

Conclusion

In Chatkal-Kurama active continental zone Upper Paleozoic (C_1 to C_3-P and P_1) and Early Mesozoic (K1) magmatism, their epimagmatogene derivatives determine the metalliferous areas in the chlorophyll-chalcophilic (Au, Ag, Cu, Pt, Pd, and others) and ftofilic-lithophilic (Nb, Ta, Be, Sn, W, REE + Y, U, Th) types.

1. In the geodynamic history of the territory of a paroxysm of magmatic activity (subduction, C_1; collision; C_{2-3}, C_3-P, P_1, K_1-within-P), each of which have associated epimagmatogenic derivatives (from the actual metamagmatogenic, contact-pneumatolytic, hydrothermal and etc.).
2. Subduction magmatism in the geodynamic stage magmatism manifested in the form of relatively small (differential) intrusions (gabbro-peridotite-anorthosite; shavazsky complex C_1). Gabbroids (Aktepa, Shavaz et al.) is controlled iron mineralization developed apatitic. Subduction geodynamic situation is favorable prospects for the territory on Ag - As, Ag-Ni, Co-As mineralization types.
3. Collision stage (C_2, C_3-R) geodynamic development of the area accompanied by the development of magmatism motley petrographic composition (gabbro intrusions monzodiorite-granodiorite-granite-leykogranite compositions, with their epimagmatogenic derivatives). Magmatism controls Cu, Mo-Au - porphyry (Kalmakyr et al.), epithermal gold-silver and silver-containing (Kochbulak, Pirmirab), and other types of mineralization. Granite leykogranite plutonogenic complex P_1 include quartz-fluorite, calcite-ankerite-uranium types of mineralization; rare earth pegmatites, apogranity, albitites, greisen (Kelenchek Tashsay-ore field, Sargardon, Barkrak, Charkasar).
4. Intraplate (P-K_1) geodynamic setting controls the non-traditional types of mineralization (diamonds, platinum metals, apatite, titanomagnetite, Koshmansay, Terekli).
5. Geological genetic model of the Upper (Karamazar, C_2-Akcha nadakie complexes) magmatism, magmatism epimagmatogenic derivatives covers, epithermal gold-silver and silver-mine (Au-Ag, Au-Te, Ag-As, Ag-Pb, Zn Association).
6. Chlorophyll-chalcophile (Fe, Au, Cu, Pt, Pd, etc.). Epimagmatogene types of mineralization are associated with subduction (C_1) stage of development of geodynamic crust-mantle plume. Becoming a

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conflict of rhyolite-trahiriolite (oyasaysko-kyzylnurinsky complex C_3-P_1) and granite-leykogranite P_1 (Arashan, Charkasarsky complexes, P_1) magmatism forms ftorofilic-lithophilic mineralization (Sn, Bi, Ta, REE + Y, U, Th, Zr and etc.). Earlier epimagmatogene metal contents in the Au, Ag, Cu, Mo, Pb, Zn, Bi, Pd, Pt, Rh, and others associated with the collisional stage (C_2, C_2-P_1; Karamazar complex C_2, etc.). The development of the territory.

Upper "basaltic" magmatism (C_1 to C_3-P and P_1) calc-alkaline (secondary product remelting main magma crust substrate) series and magmatic complexes epimagmatogenic ore (non-metallic) derivatives by reacting with the ancient (up to C_m) bark continental (mantle- mixing and crustal melts) determine the metal content areas, mainly on the types of chlorophyll-chalcophile (Fe, Cu, Mo, Au, Pt, Pd), practically significant of them - epithermal gold-silver, silver-containing (platinum-bearing) mineralization.

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