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Research Article

PETROGRAPHY OF DYKES KOCHBULAK ORE FIELD (MIDDLE TIEN SHAN UZBEKISTAN)

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ABSTRACT
The Kochbulak field is located in eastern Uzbekistan in the southwestern spurs of the Middle Tien Shan. According to the genesis, it belongs to the gold-sulphide-quartz, mainly moderate-sulphide formation, vein, localized in the late orogenic subvolcanic intrusions.
Within the Kochbulak deposit, dikes of the Guzaksay and Gushay complexes are common. The dikes of the Gushay complex are represented by granites and granodiorite porphyries, quartz monzonite porphyries, and granosyenite porphyries. The geological relationships with the dykes of the trachyrioliths and the volcanics of the Nadak complex clearly indicate the early Permian dikes of the complex. The Guzaksay complex is composed of dolerite dikes. The age of the dolerite dikes is based on the absolute age data, in the range of 295-291 million years, which is close to the geological data and dates from the early Permian.
The dikes of the Gushay complex are pre-ore, and the dolerites of the Guzaksay complex are post-ore.

***Keywords**: Petrography, Dykes, Tien Shan*

INTRODUCTION
The Kochbulak field of about 42 square km is located in the Tashkent region in the Republic of Uzbekistan, 20 km south of the city of Angren and 110 km north-east of the city of Tashkent. According to its internal structure, the Kochbulak volcanotectonic structure can be classified as a caldera.
The main features of the Kochbulak caldera were formed in the middle-upper Carboniferous, and as a result of intense magmatic activity a significant amount of andesite-dacite volcanic rocks (up to 2500 m) accumulated here. In the final stage of the formation of the Kochbulak caldera, small subvolcanic bodies were introduced, the distribution of which was probably controlled by a small ring fault of 3-4 km, spatially coinciding with the area of the Kochbulak deposit.
The area of the ore field is composed of volcanic rocks of the mid-Late Carbon dacite-andesitic formation (Arapov, 1976), which is represented by sedimentary-pyroclastic rocks (tuffs and lavas of dacites, andesidocytes and andesites), developed in the form of non-stretched, lenticular and plastiform bodies of sharply changeable power, as well as common parts, and common shafts, as well as common shafts, and common shafts, anesthesia, etc. and sill-shaped bodies and dykes of the same composition (Figure 1).
In the southern part of the ore field, granodiorites of the Middle Carboniferous, broken by dikes of the Gushay complex, are exposed. All breeds intersect with Perm dikes of the dolerites of the Guzksai complex.

MATERIALS AND METHODS
This article is written about the results of research and development works in the Ministry of Geology of the Republic of Uzbekistan on the study of the dikes of gold deposits in eastern Uzbekistan. Analytical work was carried out by the Central Laboratory of the Ministry of Geology, a petrographic study of thin sections was carried out by the authors.

RESULTS
According to geological and geophysical data, large tectonic blocks were distinguished: the southern - Gushsai, central Kochbulak and northern Kairagachsky, limited by deep faults of the north-east strike and a number of large transverse faults of the north-west direction, along which the valleys of the Nishbash, Yangokly, Gushsay rivers are developed. They define the boundaries of the corresponding tectonic blocks of ore fields with quartz-gold and alunite mineralization. The largest horizontal and vertical movements

with amplitudes up to 400-700m are characteristic of tectonic blocks concluded between the large north-western faults.

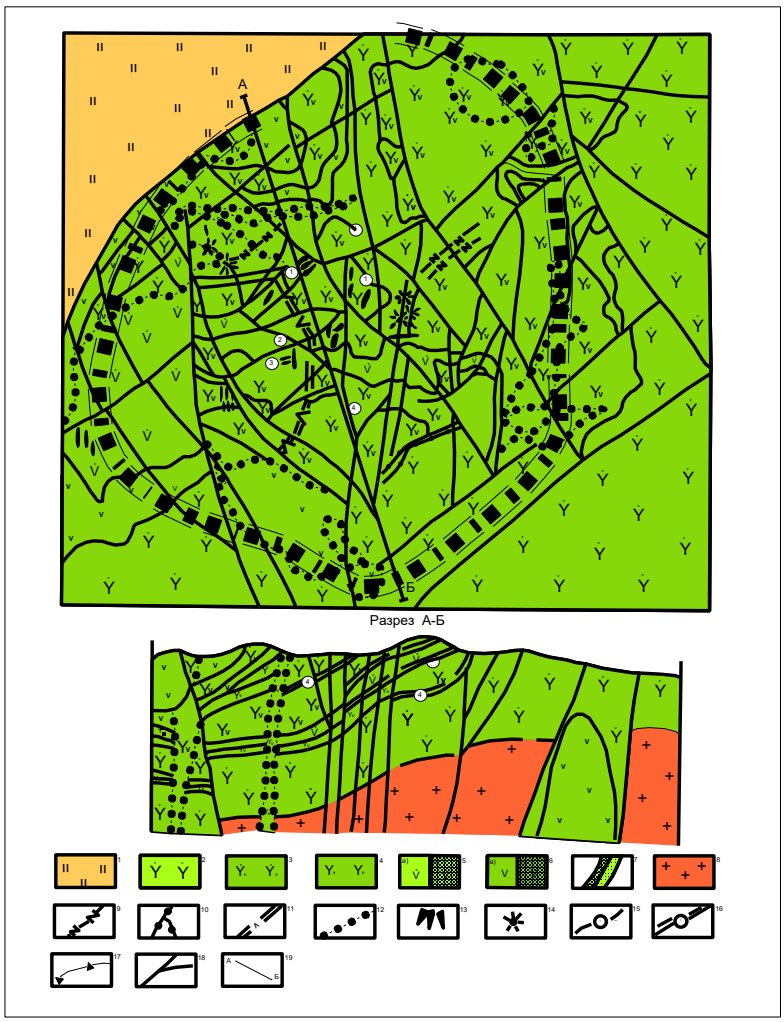

Figure 1: 1 - meso-Cenozoic sediments; 2-7 - mid-upper carboniferous vulcanites: 2 - trachyandesites; 3 - trachiandesitis; 4 - andesitodatsite; 5 - trachydocytes (a) and their tuffs (b); 6 - dacites (a) and their tuffs (b); 7 - volcanic sandstones, gravelites; 8-10 - Permian dikes: 8 - dolerites; 9 - porphyry granite; 10 - quartz monzonite porphyry, granosyenite-porphyry; 11 - ore bodies; 12 - tubular ore bodies; 13 - faults; 14 - contours of subvolcanic bodies; 15 - assumed Kochbulak caldera contour; 16 –subvolcanic bodies: 17 - gentle mineralized zones: Nishbashskaya (1), Long (2); Short

The Kochbulak deposit belongs to the gold-sulfide-quartz, mainly moderate-sulfide formation, gangue, localized in the late orogenic subvolcanic intrusions (syenite-diorite, trachiandesite porphyrites and granodiorite-porphyries) with which a paragenetic connection is assumed. It was formed at the level of transitional depths - from the near-surface to the hypabyssal facies.
Mineral composition of the Kochbulak ore belongs to a gold-polysulfide-quartz formation with two types of mineralization according to their sulfide content: low sulfide (up to 5% sulfide) and moderate sulfide (up to 10-40% sulfide). The complexity of the material composition is due to the abundance and diversity of ore minerals - more than 50. Usually several basic sulphides are present in ores - pyrite, faded ore, galena, chalcopyrite, rarely tellurides, and the remaining ore minerals are found in microscopic precipitates and are not ubiquitous. Quartz (60–70%) and sericite (20–30%) are predominant among veined minerals, carbonates (2–5%) and kaolin (1–2%) are in an insignificant amount. The geochemical peculiarity of gold-polysulfide-quartz veins is their high cadmium resistance.

Based on the analysis of geochronological data, the following conclusion can be made: the age of these volcanogenic formations can be defined as middle and upper carbon. Within the Kochbulak ore field, the dikes of the Guzaksay and Gushsai complexes, as well as the subvolcanic dykes of the trachyriolite of the Kyzylnurin complex are common.

The dikes of the Gushsai complex are widespread in the Kochbulak ore field and are several times more abundant in the number of dikes of the Guzaksai complex. The dikes of the Gushaysky complex are represented by granites and granodiorite porphyries, quartz monzonite porphyries, and granosyenite porphyries. The geological relationships with the dykes of the trachirioliths and the volcanites of the Nadaksky complex clearly indicate the early Permian age of the dikes of the Gushsey complex. Quartz monzonite porphyry and porphyry granosyenite are developed on the left side of the river Gushsay and the right side of the river. Nishbash and r. Loyak, Gushsay granites and porphyry granodiorite are found on the left side of the r. Nishbash and the right side of Tereklisay and Gushay.

Quite often, dikes of granite-porphyra and granodiorite-porphyries are found in the upper reaches of Naugarzan and Chetedy. The stretch of these dikes is northeast, 200-300 m, sometimes up to 1.5 km, their thickness is up to 10-20 m. The rocks are painted in pink, grayish-pink and brown. The composition of the rock is the main binder mass with porphyry secretions of pink and white feldspar up to 3-4 mm in size, against the background of which phenocrystals of pink feldspar (3x4 cm) sometimes stand out with a zonal structure, as well as interspersed quartz. Porphyritic rock structure, massive texture (Figure 2).

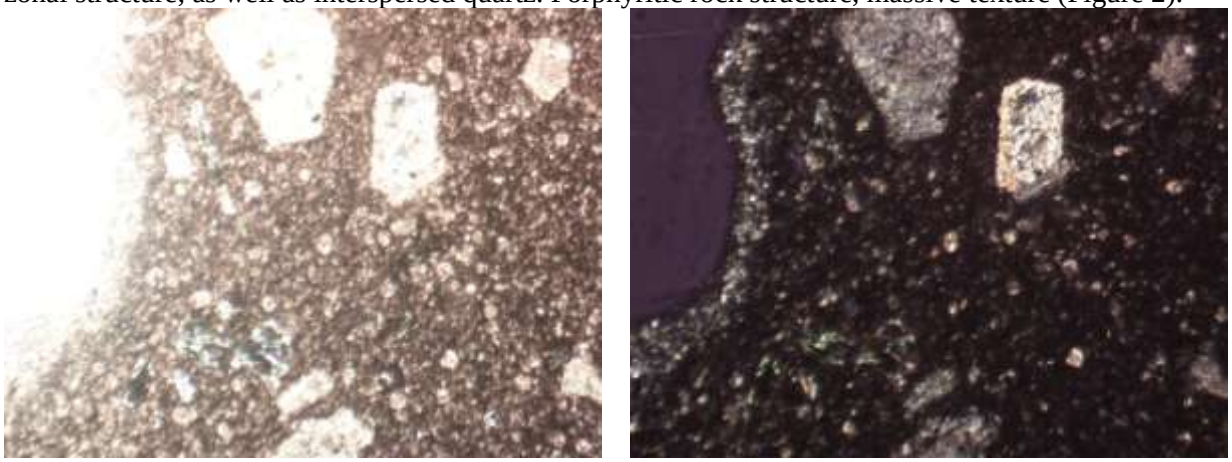

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Figure 2: Photos of thin sections of granite-porphyry. cv.42 times: COTDN-29. a) Nicols are parallel; b) Nicols are crossed

In the area of Nishbash Ruch, in its upper reaches, on the right side of Yangaklisay at the point of detailed geological observation (COTDN-83) at a distance of 300 m from the altitude. 1378.1m observed dike granite-porphyry, with a capacity of 1.6-1.8 m. The strike of the northeast dyke (75º), fall to the south-east (185º), the angle of dip 60º. Breed of brick-red color, medium-grained, dense. The main mass is crystalline, in felts of feldspar, plagioclase, quartz and dark-colored minerals.

Under the microscope, granite porphyry has a distinct porphyritic structure, porphyritic phenocrysts make up to 40% of the entire rock. Phenocrysts are plagioclase, potassium feldspar, quartz and biotite. In some sections there are rare hornblende grains. Plagioclase is most common among phenocrysts and accounts for 23-29% of the volume of the entire breed. It forms a tabular grain size of 1, -2.0 mm, rarely up to 3.0. Smaller phenocrysts of plagioclase (0.5-0.7 mm) of rectangular shape. Often they form glomeroporphyrovy accretions. In terms of composition, they respond to andesine (An38-45). All phenocrysts of plagioclase are strongly albitized, sericitized, sometimes replaced by epiditis, chlorite and carbonite. Potassium feldspar, forms small tabular grains with smooth edges, up to 2.5% of the entire breed. The composition corresponds to the microcline -2V = 74-800. The phenocrysts of the CABG are strongly pelitized, some of them form simple twins with uneven twin seams. Quartz, found in polygonal and corroded grains with even extinction. Sometimes quartz grains are surrounded by the border of the graphic structure of quartz and feldspar. The grain size of quartz from 0.3 to 1.5 mm. Biotite sharply

predominates over amphibole and is present in the form of tabular scales 0.5–1.0 mm in size. The biotite scales are replaced by chlorite, sericite, leucoxene, sometimes epidote and carbonate.
The bulk of alltrio morphiferous with poikilite structure details. The poikilitic structure is expressed in finding the quartz of the main mass in the form of poikilitic inclusions in the FSC and plagioclase.
Granodiorite porphyry occurs in the form of relatively rare dikes with a capacity of from 3 to 10-12 meters, mostly in the eastern part of the area. The fall of the dikes is steep 50-700, length up to several kilometers, the length of the individual wings 300-500m. Granodioirite porphyries are gray, pinkish-gray or pink porphyritic rocks. Porphyry secretions are represented by quartz potassium-feldspar.

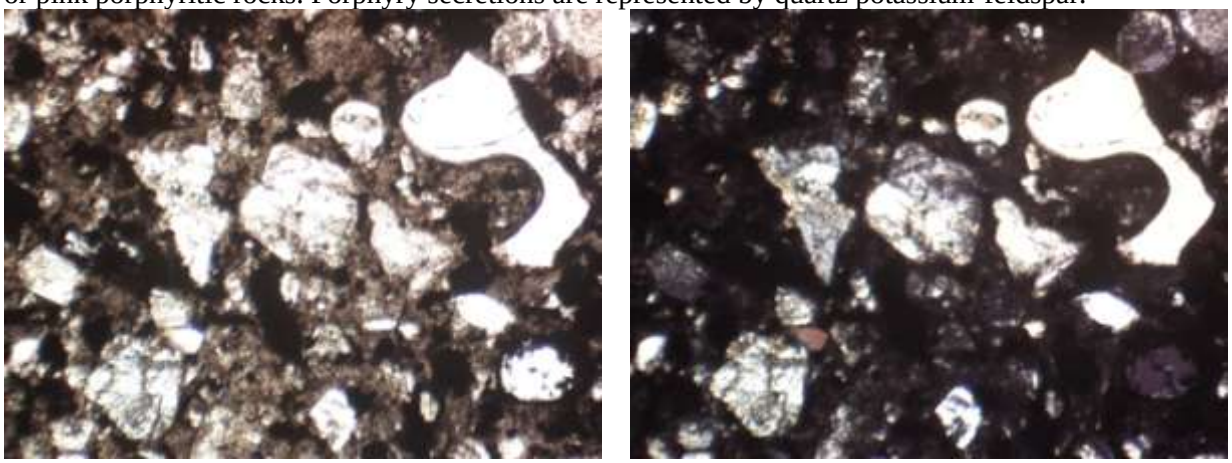

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Figure 3: Photos of granodiorite-porphyry thin sections. c.42 times: KOTDN-103. a) Nicols are parallel; b) Nicols are crossed.

Under the microscope, they have a porphyritic structure with a number of porphyritic phenocrysts of up to 30–40% of the entire rock (Figure 3).
Plagioclase sharply predominates over all other phenocrysts minerals and makes up 25% of the entire rock. It is found in zonal tabular and polysynthetic twins, 1.5-3.0 mm in size. Composition refers to andesine-labrador (An36-55).

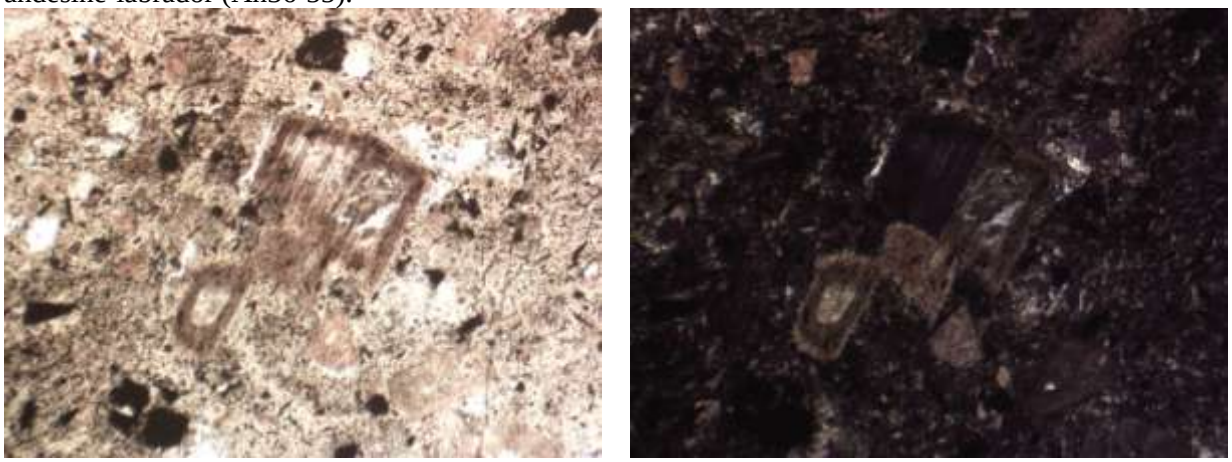

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Figure 4: Photos of thin sections of quartz monzonit-porphyries. c.42 times: COTDN-85. a) Nicols are parallel; b) Nicols are crossed.

Potassium feldspar is represented by rare tables or oval grains of orthoclase (-2V = 66-76). Quartz as KPSH is rare among phenocrysts. Quartz crystals are heavily corroded by the main mass, sometimes to skeletal forms. Fading is wavy, sometimes mosaic. The size of phenocryst quartz 0.5-0.8mm, rarely up to 3.0 mm. Quartz round crystals sometimes contain poikilite inclusions of biotite.

Biotite forms short - columnar and irregular grains with uneven jagged edges of light brown color with sharp pleochroism. The grain size of biotite is 0.3-0.5 mm, rarely up to 1.5-2.0 mm.
Amphibole is represented by an ordinary hornblende of a dark green color, with a weak pleochroism from dark green in Ng to greenish yellow in Np. C: Ng - 18-25, -2V = 62-700. The grain shape is long prismatic, rhombohedral, 0.6-2.0 mm in size, sometimes up to 5.0 mm.
Porphyritic phenocrysts are enclosed with micro-cykilitic, spherulite-micro-microcylite basic mass. The main mass consists of a quartz-feldspar aggregate with rare fine albite tables.
Quartz monzonite porphyry pink, red sometimes greenish, fine-crystalline, massive, with a thickness of several meters (20-40 m), a length of several tens and hundreds of meters, mostly of the northeast direction. The breed consists of the main mass and porphyry secretions, in the ratio 1: 3.
Porphyries secretions are represented by quartz, plagioclase and potassium feldspar.
Under a microscope, porphyry phenocrysts in quartz monzonite porphyry make up from 30 to 45% of the whole rock and are composed of plagioclase, biotite, calinatine feldspar, amphibole, and quartz (Figure 4).
Plagioclase is present in grains of two generations. The first generation of plagioclase was encountered in the form of phenocrysts of sizes 1.5–5.0 mm. They form grains of tabular form, are unevenly distributed in the rock, often form glomeroporphyry fusions. They are encountered in the form of polysynthetic and zonal twins with direct zonality. The composition of phenocrysts of the first generation corresponds to the andesine (An47-50) in the zonal crystals, the edge parts have the composition of andesine (An38-40), and the central parts have a slightly basic composition (An50-51). The second generation plagioclase is smaller grains of tabular appearance with a size of 0.4-0.6 mm, and they also belong to andesine in composition (An37-40). All plagioclases are pelitized and partially albitized. The central parts of the zonal crystals of the first generation plagioclase are replaced by an epidote-kaolin aggregate and sericite.
Potassium-soda feldspar forms single short-prismatic and rectangular tables with a size of up to 1.0 mm, and is 0.5-2.0% of the entire breed. All grains are intensively pelitized.
Quartz, found in rare xenomorphic grains with traces of corrosion, the grain size is not more than 0.5-1.5 mm. The margins of quartz phenocrysts are sinuous and jagged with wavy or mosaic fading.
Phenocrysts of biotite and amphibole in the amount of 10-12% of the entire breed.
Biotite forms tabular scales with a size of 0.5-1.5 mm of dark brown color with sharp pleochroism of dark brown to black in Ng and to light yellow in Np.
Amphibole prevails a little over biotite. Forms prismatic, columnar and rhombic crystals, often with simple twins. Pleochroism distinct. The composition corresponds to the ordinary hornblende (c: Ng = 18-23).
The main mass is prismatic granular with elements of poquilite and granophyre structures. It consists of an aggregate of plagioclase and quartz; sometimes it is noted for the novaceous intergrowth of quartz and KPSh. The grain size of the main mass is 0.03-0.05 mm.
The Guzaksay complex is composed of dikes of dolerites of the northeast strike. The age of the dolerite dikes is based on the absolute age data, in the range of 295-291 million years, which is close to the geological data and dates from the early Permian.
Dolerites are widely developed in the Sahash Lashkerek, Gushsai, Nishbash basins. So on the left side of the lower reaches of the river. Nishbash, located to the north-east (60º) at a distance of 400 m from the altitude of 1329.7 m is a point of detailed geological observation (KOTDN-105), indicating the relationship between the doderite dikes and the andesite massif. Dolerites form dikes with a capacity of 0.8-1.3 m, length up to 1000 m, strike azimuth to the northeast, azimuth of dip 120-150º to the southeast, with steep dip angles up to 85º. Macroscopically dark-gray, fine-grained, microcrystalline, dense rock. The inclusions are represented by pyroxene, hornblende, plagioclase, and dark-colored minerals. Tempering of dikes is dark gray to black with a thickness of 2-3 cm. Microscopically porphyry dolerites with poikilofitovy, ophitic, or toleitic base mass. Porphyry secretions are composed of plagioclase and olivine and make up 10-15% of the total rock volume. Plagioclase is a widely tabular crystals with zonal, rarely polysynthetic twins, its composition refers to andesine –labrador (An45-53). The surface of the grains is turbid and slightly brownish due to intensive politicization and sericitization. Twin seams are smooth, however, the edges of the grains are strongly corroded by the bulk. The poikilitic inclusions of

the third generation plagioclase are also noted in them. Olivine among phenocrysts is the most common mineral, up to 75% of all porphyritic secretions. It forms an idiomorphic colorless diamond-shaped, rounded grains slightly eroded from the edges, up to 1.5 mm in size. All the grains of olivine are completely replaced by a mixture of serpentine, chlorite and idingsite; thin opacitic rims of the ore mineral are sometimes visible along the edges of the grains. The bulk is composed of plagioclase, ore and apatite. The main plagioclase is found in two generations of grains; they form elongated thin tables of polysynthetic twins with strongly corroded edges, 0.1-0.5 mm in size (Figure 5). In composition, they belong to andesine (An32-39). In addition to plagioclase in the bulk of the primary rock-forming minerals are not found. In some dolerites, a thin rash of iritis and magnetite appears in the bulk.

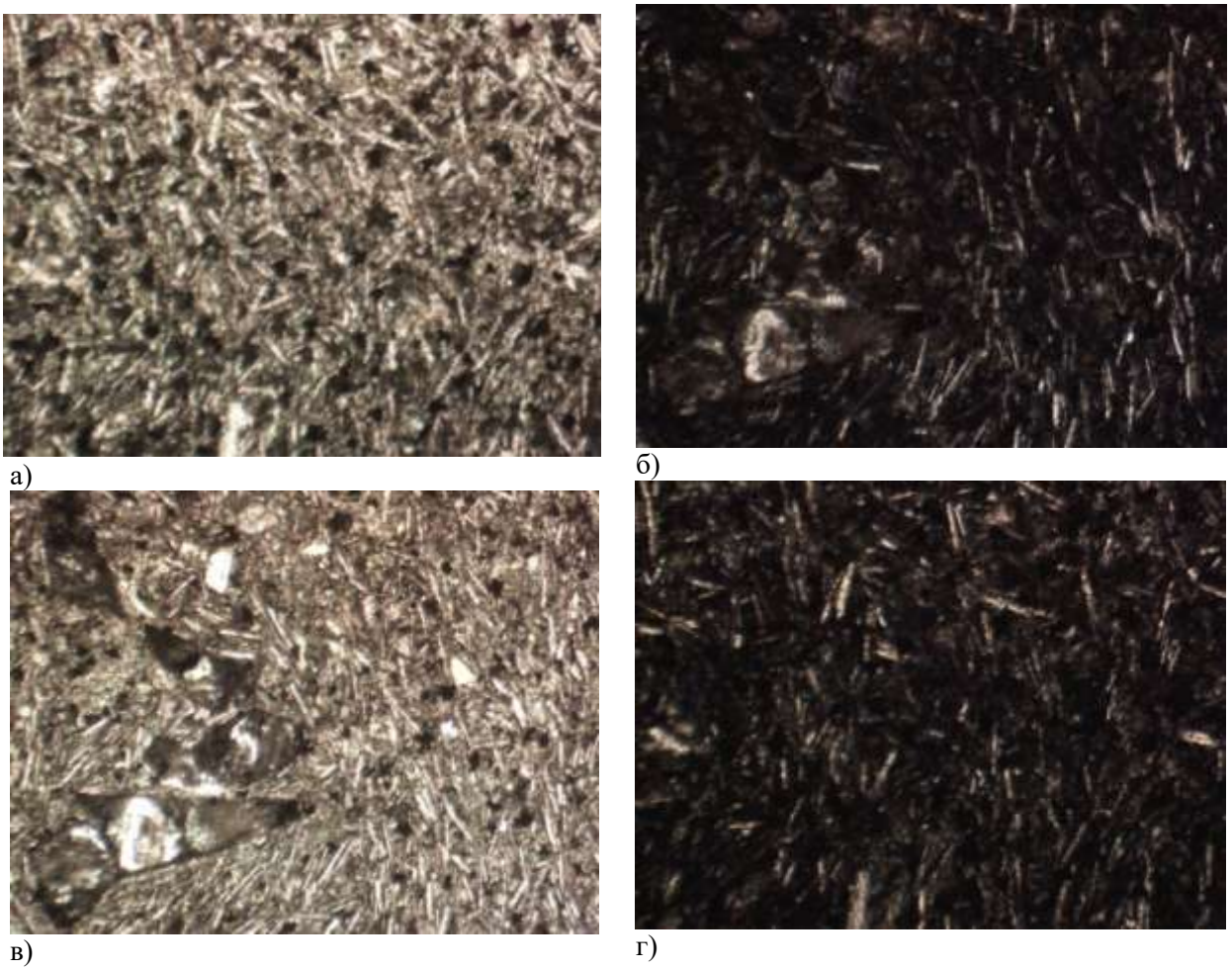

Figure 5: Photos of thin sections of dolerite wv.42 times: KOTDN-80. a) Nicols are parallel; b) Nicols are crossed; KOTDN-94. c) Nicols are parallel; d) Nicols are crossed

The above material shows that the age of mineralization of the Kochbulak deposit is in the range of Upper Carboniferous - Lower Permian. The dikes of the Gushay complex are pre-ore, the dolerites of the Guzaksay complex are post ore.

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