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PETROGRAPHIC FEATURES OF DYKES OF DIABASE PORPHYRITES AND LAMPROPHYRES OF KULDZHUKTAU (WESTERN UZBEKISTAN)

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ABSTRACT
Relatively higher values of the average contents of iron, titanium, and vanadium were revealed in the basic dykes of the Tozbulak area than in similar formations of the Kyngyrtau area. The basic dykes of Kyngyrtau are distinguished by relatively high contents of chromium, cobalt and nickel than in the Tozbulak area. Lamprofirs of the Tozbulak area differ from lampirfyrs of Kyngyrtau in relatively high contents of lead and zinc. In all types of dikes of the Kuluktau diabase-lamprophyric formation, the clark concentrations of arsenic, selenium, and antimony, the associated elements of gold and silver, increase tenfold, and in some cases even a hundredfold.

Keywords*: *Diabase-porphyrite Dykes, Tozbulak

INTRODUCTION

Among the diverse dyke rocks of Kuljuktau, diabase porphyritic and lamprophyry play an important role. They are concentrated on two areas: Tozbulak and Kyngyrtau. The question of the formation affiliation of these dyke formations has been considered for a long time, but has not yet been resolved and is debatable. Some researchers attribute them to gabbroid, others to granitoid formations. At the same time, no special study of dyke formations, with rare exceptions, has been conducted, and they are traditionally associated genetically with the magmatites with which they are associated. The third group of researchers believes that regionally developed dikes of basic and medium basicity rocks belong to independent formations of small intrusions. The latter occur in folded regions after their consolidation due to intraplate mantle magmatism (Shilo, 2004; Safonov, 2015; Rock et al., 1989; Kerrich R., Wyman, 1994).

Dikes of diabase-porphyrites and lamprophyres are most concentrated inside and around the Tozbulak and Kyngyrtau granitoid massifs, compared with other parts of Kuldzhuktau, they are confined to steeply falling cracks crossing all sedimentary-metamorphic, igneous rocks. Diabase-porphyrites break through both scarred limestones and nepheline syenites. Dikes of diabase-porphyrite formation are often found among sedimentary-metamorphic rocks and at a considerable distance from the massif (tens of kilometers). The angle of incidence of these dikes is 800-850 on SV (330-340o) and up to 900. The azimuth of the dike strike is approximately SV 60-70o. Most dikes have a capacity of up to 3-4 m and a length of no more than 700-800 m.

Diabase-porphyrite dykes: Diabase-porphyrite dykes visually represent a porphyry rock with a fine-grained or fine-grained bulk. The color of the main mass of the breed is dark gray, almost black, dark greenish-gray. Crystals of white, gray, idiomorphic plagioclase, ellipsoidal, rounded smoky-gray or almost transparent quartz, black idiomorphic prismatic amphibole are abundant in the rock; rounded (idiomorphic) pink potassium feldspar are rare (rare biotite is added to them under the microscope).

The granularity of the bulk of diabase porphyrites varies in each dike, depending on which the number and size of crystals change. In the central part of the dikes, the rock is fine-grained or fine-grained with abundance of porphyry secretions, and in the direct contact of the dikes, the bulk of the rock is even finer-grained with a decrease in the number and size of porphyry.

The structure of diabase porphyrites, as noted above, is porphyritic. Porphyry secretions of plagioclase, pyroxene and amphibole have well-developed crystallographic facets. Amphibole inclusions are found in plagioclase. Phenocrystals of feldspars are corroded by the bulk; they contain inclusions of amphibole, plagioclase, apatite, sphene and zircon.

The structure of the bulk of the rock is full–crystalline, prismatic-granular. The idiomorphism of plagioclase, pyroxene and amphibole of the main mass is almost the same, but sometimes plagioclase is more idiomorphic. Xenomorphic quartz is rarely found in the bulk, which fills the gaps of plagioclase and amphibole. Accessory minerals (apatite, zircon and sphene) in the form of idiomorphic crystals and are included in porphyry secretions of plagioclase, pyroxene, amphibole and biotite. Apatite is most developed in the bulk. Titanite is also included in femic rock-forming minerals in the form of idiomorphic grains.

Among porphyry minerals from the magmatic melt, plagioclase was the first to stand out. Almost simultaneously pyroxene, later hornblende, then biotite. Accessory minerals (apatite, sphene, zircon and ore) were isolated at the very beginning of the crystallization of the melt. Then the crystallization of the bulk of the rock occurred. The order of allocation of accessory minerals and porphyry secretions is preserved in relation to the minerals of the main mass.

Lamprophyre dikes: Lamprophyre dikes of the studied region visually differ from each other. This is due not so much to the differences in their mineral composition as to the textural and structural diversity. There are uniformly granular massive homogeneous, spotty irregularly granular (taxite), as well as globular textures. At the same time, all of the above textures can occur even in one low-power dyke.

All dikes are characterized by a structure typical of lamprophyres – a leucocratic bulk, which contains panidiomorphic phenocrysts of amphibole, sometimes pyroxene and pseudomorphosis by primary inclusions. The bulk can be either vitreous or crystallized. At the same time, it is possible to distinguish some specific textural and petrographic features for the Tozbulak and Kyngyrtau areas of lamprophyre dikes.

Lamprophyre dikes of the Tozbulak area are mainly represented by spessartites. They are later than diabase-porphyrites, by mutual intersection. They also broke through granites, diorites and sedimentary metamorphic rocks containing them. Dikes of spessartites have also broken through dikes of granite-aplites and pegmatites.

The main minerals of spessartites are hornblende (about 50% or more), pyroxene and plagioclase. Plagioclase was isolated after dark-colored rock-forming minerals. Quartz is of secondary importance (Fig. 1). Accessory minerals are represented by apatite, zircon, ilmenite, titanite, pyrite, chalcopyrite, nickel, orthite, thorite, etc.

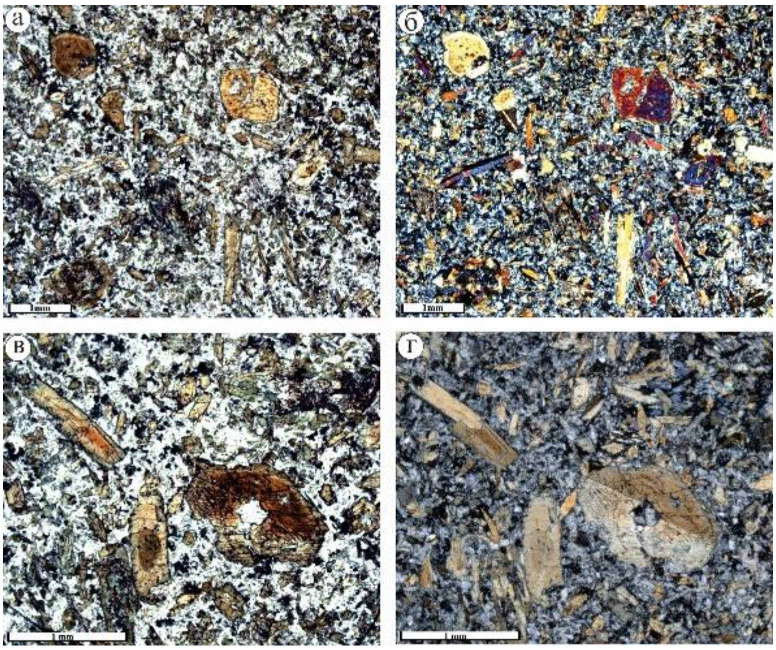

Figure 1. The forms of separation and the relationship of rock-forming minerals in the central part of the spessartite dike.

The rock is composed of idiomorphic amphibole grains (Amf), less often pyroxene – augite (Px), located in a microcrystalline bulk consisting of plagioclase (Pl), a small amount of secondary quartz (Q), amphibole (Amf) and ore minerals (black). The structure is lamprophyric, the texture is massive.

Dikes of spessartites often have a globular texture, which was previously used as a diagnostic feature of these rocks (Fig. 2). Among the dikes studied by us, such a texture is characteristic only for dikes of the Tozbulak area. The boundary of the globule is always marked with iron oxides. The inner part of the globule is composed of an aggregate of quartz-sericite-chlorite-carbonate composition with an abundance of ore minerals. The extreme zone of the globule is more leucocratic, composed of quartz-carbonate aggregate.

Large amphibole inclusions sometimes "clothe" globules, which indicates their formation at the magmatic stage. In most cases, amphibole phenocrysts are found both inside the globule and outside. The globular texture is manifested both in the marginal parts of dikes and in the central parts of dikes with a massive texture. The distribution of lamprophyre dikes in the Kyngyrtau area is uneven. The greatest concentration of dikes is observed along the northern and eastern contacts of the East-Kyngyrtau intrusive with host rocks, which were used, perhaps, as the most weakened zones. Among them, Odinites and Malchites are more widespread than Spessartites.

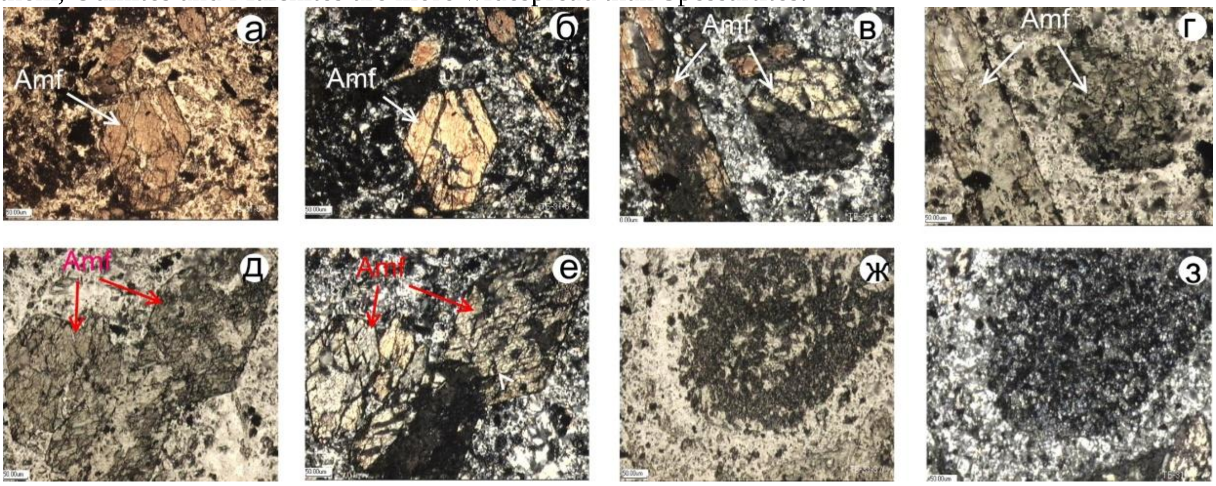

Figure. 2. Structural and textural features of the spessartite dyke.

a-e – idiomorphic phenocrystals of unchanged (a, b) and chloritized (d-e) amphiboles; g-, z – globules, the inner part of which is composed of an aggregate of quartz-sericite-chlorite-carbonate composition with an abundance of ore minerals, the extreme zone is more leucocratic, composed of quartz-carbonate aggregate; a, g, d and f are parallel nichols; the rest are crossed.

Dykes of Odinites along the stretch are the shortest dikes, traceable at 20-50 m. In addition to the typical dikes, they form an irregular shape in terms of the body. They are characterized by significant uniformity in terms of mineralogical composition. Under the microscope, the rock consists of plagioclase, pyroxene, amphibole and biotite. Secondary minerals are potassium feldspar and quartz (Fig.3).

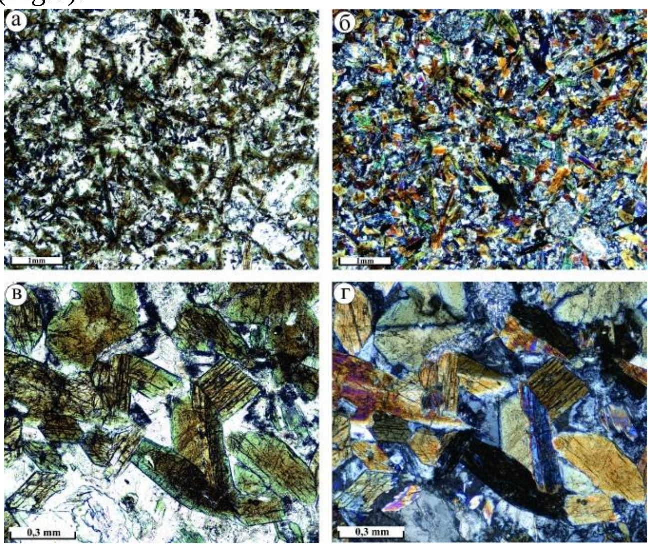

Figure 3. Textural and structural features of the odinite dyke.

a-b – fine porphyry separation of augite and amphibole in the plagioclase basis; c-d – the relationship of porphyry separation of zonal plagioclase by elongated prismatic grains of augite and amphibole; a and b – nichols parallel, b and d – nichols crossed.

Plagioclase forms short-prismatic or tabular grains and responds to oligoclase (An14) and andesine (An39). There are zonal crystals of plagioclase, which rarely forms porphyry inclusions.

Pyroxene occurs in the form of inclusions, as well as in the bulk. The inclusions are represented by elongated prismatic crystals, in the bulk pyroxene forms small isometric grains. Refers to augite c: Ng=45-50^0.
Amphibole is represented by an ordinary hornblende. Forms prismatic crystals of dark green color. It forms small porphyry inclusions up to 1.5 mm in length. When changed, it turns into chlorite.
Malchites are dark gray, fine-grained dense rocks consisting of plagioclase and hornblende. Minor minerals are biotite, quartz and kalishpat. Accessory minerals are magnetite, apatite, titanite. Secondary minerals are represented by chlorite, biotite. The structure of the rock is micrograined (Fig. 4).

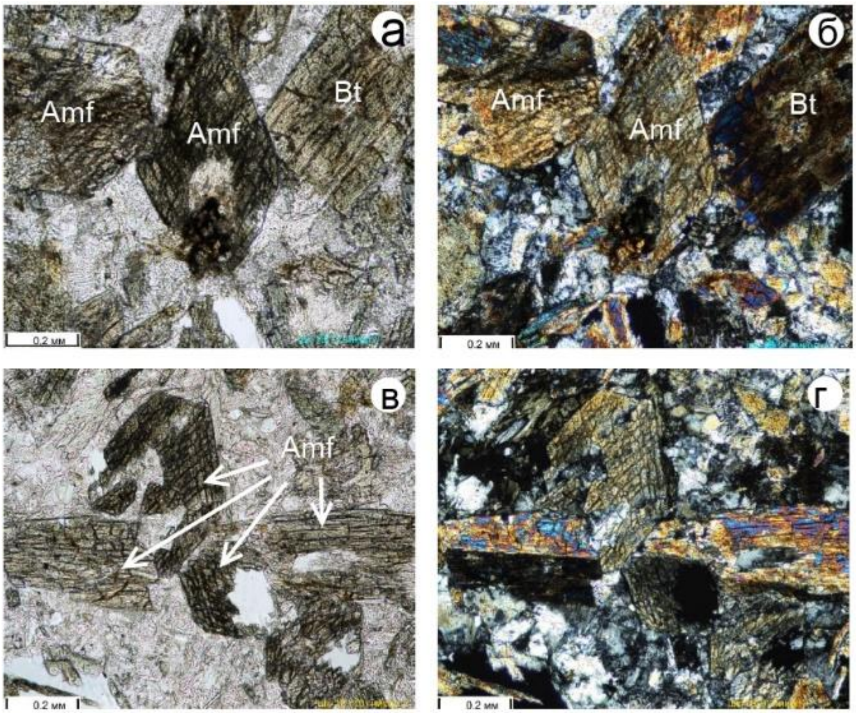

Figure 4. Idiomorphic phenocrystals of amphibole and biotite in a malchite dike.

a-g – massive texture and fine porphyry structure of malchite; fine porphyry secretions are represented by amphibole, biotite and plagioclase; a and b are parallel nichols, b and g are crossed nichols.

Plagioclase is represented by short-prismatic crystals. The composition corresponds to andesin. Kalishpat and quartz form very small xenomorphic grains in small quantities. Amphibole forms elongated-shestovatye crystals, represented by a brownish-greenish ordinary variety of hornblende. When changed, it turns into chlorite and rarely into biotite.
The presence of minerals such as amphibole, biotite, apatite, carbonate in diabases and lamprophyres of Kuldzhuktau, i.e. minerals rich in volatile constituents, and ore-generating micro-separations of silica-chloride fluids, suggests that the primary magmatic solution that gave the described dikes was enriched with alkalis and ore-generating fluids.

CONCLUSION

In all types of basite dykes of Kuldzhuktau, increased gold and silver contents are noted. According to this, clarks-concentrations of arsenic, selenium and antimony – associated elements of gold increase tenfold, and in some cases even a hundredfold. This indicates the connection of gold-silver mineralization, established in these areas of Kuldzhuktau, with dikes of diabase-porphyrites and. This is confirmed by the determination of gold, silver and platinoid impurities in primary sulfides and sulfoarsenides, as well as in preserved ore-generating fluid micro-separations, and native silver minerals in rock-forming minerals according to the results of microprobe studies.

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