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Research Article

GEOLOGICAL AND PETROGRAPHIC CHARACTERISTICS OF BASIC DYKES IN THE TASQAZGAN AREA (WESTERN UZBEKISTAN, KULJUKTAU)

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ABSTRACT
This paper presents information on the study of the geological and petrographic features of the mafic dikes in the Taskazgan area. It provides original data on the material composition and petrographic properties of rock-forming minerals found in the dikes. The occurrence forms and material composition of the rock-forming minerals in the mafic dikes of Taskazgan were determined using a polarizing microscope and microprobe analysis.

Keywords: *Kuljuktau, Petrographic, Dike, Plagiodiabase, Dolerite, Camptospessartite, Gabbro-Peridotite, Lamprophyre, Vein-Like, Microprobe Analysis, Basic Dykes*

INTRODUCTION

In the Kuljuktau Mountains, diabase and lamprophyres play an significant role among various dike and intrusive rock types. Although issues related to the formation and mineralization of these dikes have long been studied, they have not yet been fully resolved and remain subject of debatable. Some researchers classify them as belonging to gabbroid formations, while others attribute them to granitoid formations. Due to the lack of specific research on the petrogenesis and mineralization of dike formations in Kuljuqtau, some researchers have considered them genetically related to co-occurring magmatic rocks. Another group of researchers suggests that these basic and intermediate dikes, which have a regional distribution, belong to the vein facies of independent small intrusions [1-5].

The Beltau gabbro-peridotite massif is located in the southwestern part of the Central Kyzylkum, west of the Kuljuktau mountain range, and the Tasqazgan graphite deposit is situated at its exocontact; therefore reason, the area is known among local geologists as the Taskazgan area. The Beltau gabbro-peridotite massif, which includes lherzolites, troctolites, norites, gabbros, anorthosites, granosyenites, and other intrusive rocks, is of great importance to its geological structure [1-3]. The massif intrudes as a lopolith-like body into Upper Silurian and Middle Devonian dolomitized and marbled limestones, dolomites, and siliceous-carbonate rocks.

In the eastern and southeastern parts of the Taskazgan area, a high concentration of dikes composed mainly of diabase, and less commonly lamprophyre, is observed. It should be noted that vein derivatives of the Beltau (Taskazgan) gabbro-peridotite massif rocks - dolerite, olivine dolerite, plagiodolerite, and rarely plagiodiabase and lamprophyre dikes - are found in this area. The dikes are 1-3 m thick and range in length from 5 m to 500 m [4]. Most of them are submeridional orientation extending in a northeasterly direction. They are more common in the northwestern part of the Beltau gabbro-peridotite massif than in its central and southeastern parts.

The presence of rhombic pyroxene - hypersthene, and monoclinic pyroxenes – (augite and its subcalcic varieties) in the diabase dikes of the Tasqazgan area suggests that they may be derivatives of the gabbronorites from the Beltau gabbro-peridotite massif.

Fig. 1. Photographs of hand specimens from the dikes of the Taskazgan area. a - diabase; b - dolerite; d - camptospessartite.

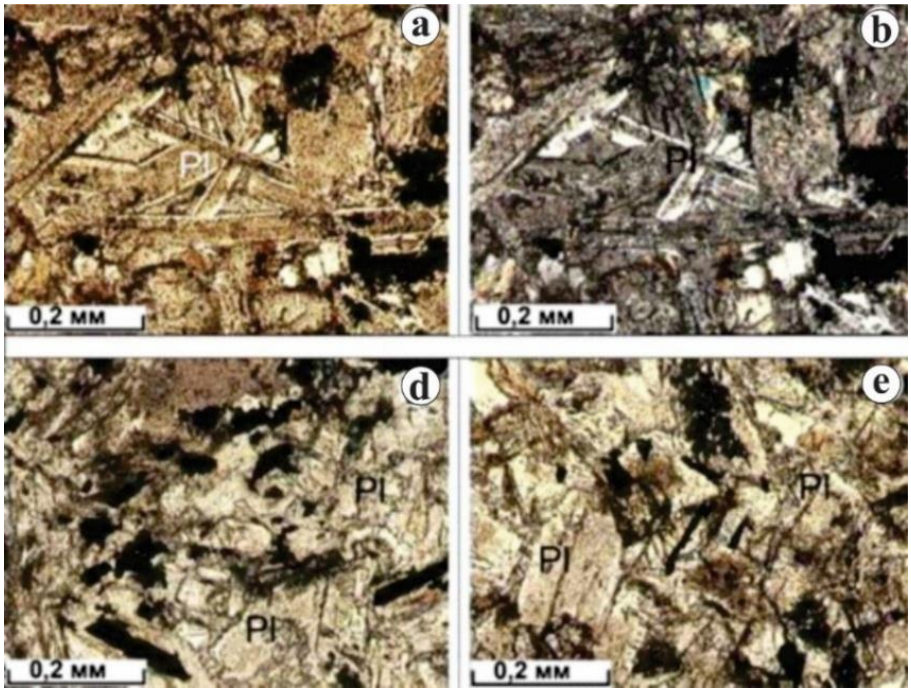

Fig. 2. Plagiodiabase. Thin section No. BL-7. a - microphotograph taken without an analyzer, the remaining images taken with the analyzer inserted; a-b - The characteristic (typical) structure of altered plagiodiabase. The voids are filled with chlorite and actinolite, and the plagioclase microlites are typically saussuritized; in some cases, an albite rim is developed along the plagioclase; d-e - An accumulation of ore minerals (black) represented by acicular crystals of ilmenite and anhedral grains of sphene within the plagiodiabase.

Plagiodiabase dikes contain minor amounts of amphibole (tschermakite). It differs from high-titanium tschermakite and ferrotschermakite by its very high aluminum oxide content (Al_2O_3 - 28.09%), low alkalinity ($Na_2O + K_2O$ - 0.12%), and the presence of nickel (NiO - 0.30%) and cobalt (CoO - 0.16%) impurities (Table 1).

The high basicity of the plagioclases that constitute the diabases of the Taskazgan area is noteworthy (Table 2). An analysis of the chemical composition of the plagioclases indicates that their anorthite component content does not fall below 50. This is explained by the high concentrations of Al_2O_3 (29.30%) and CaO (12.75%), as well as the minimal concentration of Na_2O (3.93%) in the grains of the described mineral. The plagioclases in the diabase dikes correspond to labradorite (An64) and bytownite (An79). As a result of postmagmatic-metasomatic alteration, an albite rim (An5) has formed along their margins.

Table 1: Microprobe analysis results of amphibole and mica from the basite dikes of the Taskazgan area (Taskazgan deposit, Central Kyzylkum), in %

№	n	SiO_2	TiO_2	Al_2O_3	FeO*	MnO	V_2O_3	Cr_2O_3	MgO	CaO	Na_2O	K_2O	P_2O_5	NiO	CoO	Jami
Amphibole group minerals																
БЛ-36	1	37.87	0.28	28.09	8.76	0.18	0.14	0	9.64	14.18	0	0.12	0.17	0.30	0.16	99.89
АХ-48	2	41.52	1.4	11.69	15.89	0.36	0	0	12.29	10.66	1.66	0.87	0	0	As-0.02	96.36
Mica group minerals																
БЛ-36	2	35.05	4.38	14.37	19.17	0.11	0.17	0.40	13.47	0.10	0	7.49	0	0.03	0.23	94.97
БЛ-49	3	37.32	4.25	14.70	13.94	0.08	0.26	0.28	15.31	0.10	0	9.49	0	0.01	0	95.74
	2	46.92	0	34.56	1.33	0.01	0	0	0	0.29	0	11.53	0	0	0	94.64
Chlorite																
АХ-48	5	27.22	0.02	14.21	26.67	0.07	0.29	0.04	2.2	13.11	0	0	0	Cu-0.24	0	84.07
АХ-49	6	33.26	2.47	13.17	21.18	0.08	0.07	0.03	12.17	2.53	0	1.99	0	0	0	86.95

Table 1: Microprobe analysis results of feldspars from the bazite dikes of the Taskazgan area (Taskazgan deposit. Central Kyzylkum). in %

№	n	SiO_2	Al_2O_3	FeO*	MnO	CaO	Na_2O	K_2O	Jami
БЛ-49	5	53.51	29.30	0.46	0.01	12.75	3.93	0.22	100.18
АХ-46	1	63.06	20.31	0.14	TiO_2-0.09	2.12	3.14	11.14	100
АХ-48	2	67.42	19.68	0.17	Cl-0.03	0.87	8.16	0.07	97.03
АХ-49	5	57.36	26.08	0.21	MgO-0.18	8.91	5.6	0.37	98.71

The dolerite dike possesses a fully crystallized. weakly porphyritic texture (Figure 3). Ophitic and poikiloophitic structures are dominate in its internal composition. The ophitic structure is characterized by the presence of large. elongated grains of plagioclase.

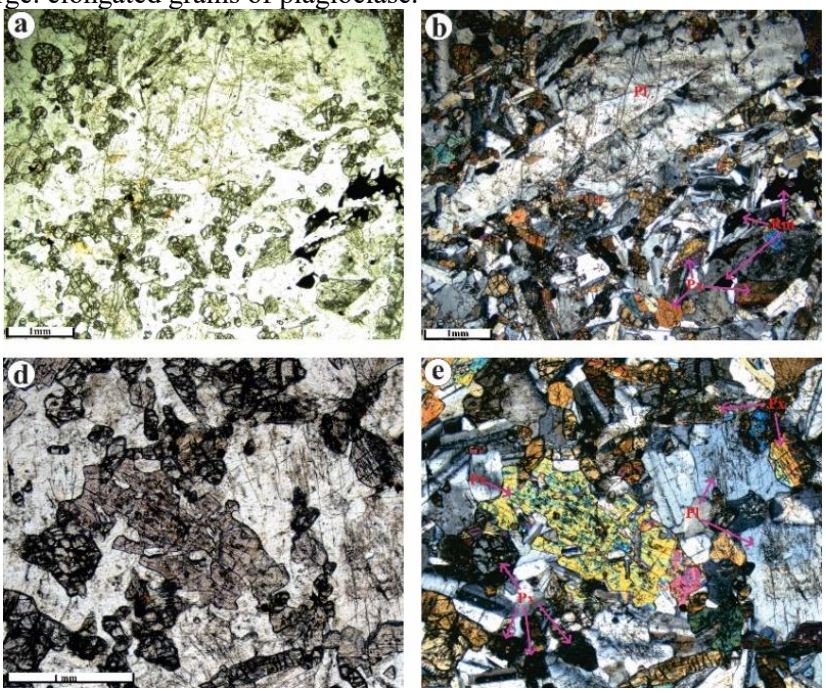

Fig. 3. Taskazgan area. Structure and texture of the dolerite dike. Px - pyroxene. Pl - plagioclase. Rm - ore minerals. Thin section No. AX-46. a-d - parallel nicols. b-e - crossed nicols; a-b - ophitic structure. d-e - poikiloophitic structure.

The poikiloophitic structure is characterized by short. columnar inclusions of plagioclase. occuring as poikilites within elongated pyroxene grains. This indicates that the plagioclase crystallized earlier than the pyroxene. The rock is weakly cataclastic. which is substantiated by the presence of fractures passing almost perpendicularly through the elongated plagioclase crystals. The mineralogical composition of the dolerite dikes was determined to be as follows: plagioclase (60%). pyroxene (30-35%). and accessory ore minerals (3-4%). The pyroxene consists mainly of augite and diopside. Secondary iron oxides are found in the cleavage fractures of weakly altered pyroxene grains. Sometimes. mineral accumulations of pyroxene and dark ore minerals (magnetite. ilmenite. etc.) form mineral parageneses in the form of schlieren.
A kamptonite-spessartite dike intrudes the limestones and gabbros in the Taskazgan dike field. The rock is fine-grained. almost aphyric. sometimes weakly porphyritic. and is dark gray in color. It contains fine. massive sulfide grains. Thickness is 3.5 m. Length is 500 m. The strike azimuth is 300° NE and a dip angle of 70°. (Fig. 4.)

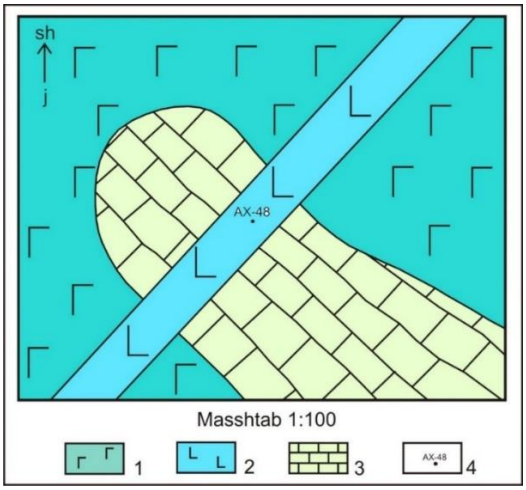

Fig. 4. Geological relationship between limestones. gabbros. and a camptospessartite dike (Taskazgan area). Conventional signs: 1 - gabbro. 2 - camptospessartite. 3 - limestone. 4 - sampling location.

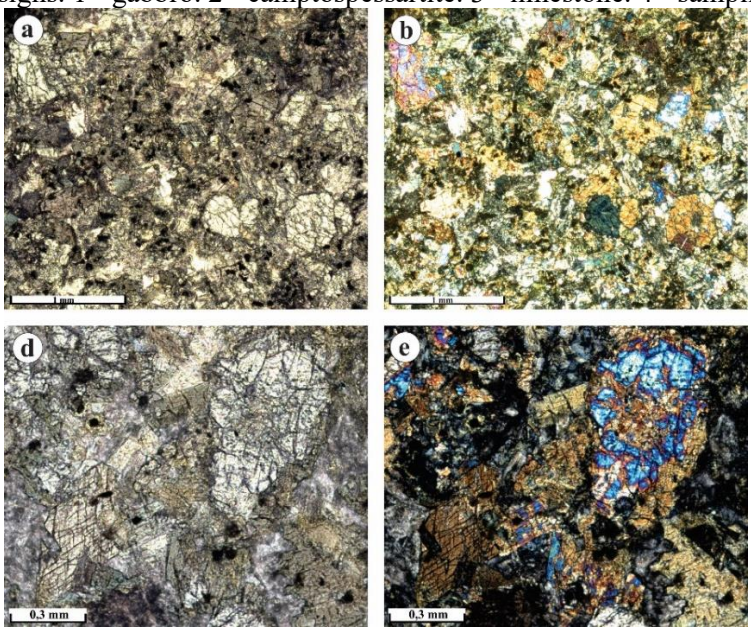

Fig. 5. The Taskazgan dike swarm. The structure and texture of the camptospessartite dike. Thin section No. AX-48. a-d - plane-polarized light. b-e - cross-polarized light.

Microscopic examination of the camptospessartite dike reveals that the largely unaltered porphyritic phenocrysts are primarily composed of titan-augite and amphiboles. In the groundmass. altered plagioclase is more abundant than other minerals.

CONCLUSION

Based on research findings and an analysis of previous studies. the few camptospessartite dikes occurring in this area have been identified as belonging to the Permian-Triassic South Tian-Shan complex. A study of the basite dikes - plagiodiabase. dolerite. and camptospessartite - in the Taskazgan area has shown that they are less common in the Kuljuktau Mountains compared to other regions. Geological and petrographic investigation revealed that plagiodiabase is the most prevalent type among these dikes. The dolerites are considered to be derivatives of the Lower Carboniferous Beltau gabbro-peridotite massif. which contains sulfide copper-nickel mineralization.

Based on research findings and an analysis of previous work. the few camptospessartite dikes observed in this area have been identified as belonging to the Permian-Triassic South Tian-Shan complex.

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