

LAMPROPHYRES IN THE ULTRABASICS SOUTH OF KOZANI*

by

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Introduction.

The geology of the Kozani area, and especially its ultrabasic rocks, have in recent years been the subject of two major publications (see ref.), both of which supply detailed geological and petrographical descriptions.

The major geological features of the immediately adjoining area to the Southeast, and across the river Aliakmon, are similar, as would be expected. However, the ultrabasic rocks show some minor phenomena which apparently lack elsewhere and which are presented as a supplement to the extensive data about the region.

General setting.

The area in question is located about 25 km SSE of Kozani, between the villages of Mikrovalton, Tranovalton and the monastery of Zidanion, at the Southern limits of the Neogene basin of Kozani.

Old terrace levels are cut by steep ravines running North to the Aliakmon. Good outcrops of ultrabasic rocks are found along the sides of the deeper ravines, which also show a general increase in thickness of the Neogene sediments from South to North.

The shape of the ultrabasic mass – when uncovered of overburden – reminds of a funnel, with its wide opening to the North and its narrow outlet to the South. The borders of the ultrabasics are rarely well exposed and mostly covered by the sediments.

Eastern contacts, with the crystalline schists of the Kamvounia (cf. BRUNN, p. 23) are clearly conformable. The schists strike generally North and dip flatly to the West.

At its Western side the ultrabasic mass is dominated by a ridge of limestones which also dip very flatly to the West. A contact between the ultrabasic and the limestone was nowhere observed, thin schist slices which are common in the contact zone appear to separate them. The bottom layers of the limestone are recrystallized to a white marble which is quarried near the village of Tranovalton.

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Φηφιακὴ Βιβλιοθήκη "Θεοφράστου" - Τμήμα Γεωλογίας, Α.Π.Θ.

In the South, the ultrabasic mass diminishes to a narrow sill which continues along the lower slopes of the limestone ridge beyond Tranovalton. Following the trend, outcrops of the sill occur in the hills across the dried lake - in the lower part of the valley of Tranovalton - and along the road leading to the village of Lazarades.

The ultrabasics disappear under the Neogene sediments to the North. At one location the Northern limits are formed by a brecciated fault cliff, facing the sediments of the Aliakmon valley.

Lithology.

The Ultrabasics. Serpentinization of the ultrabasic rocks has reached an advanced stage and it is only in the Northern part of the area, where the outcrops cover a wider range, that a dunitic «core» is encountered. The dunite formed apparently a rather undisturbed unit during regional shearing, which strongly affected the surrounding serpentine. Along the contacts with the crystalline schists, f. e., the serpentine is usually mylonitic. However, such «slaty» serpentine is also found at many places within the ultrabasic mass. The transition from serpentine to dunite is always a gradual one.

The dunite is homogeneous and fine grained. Locally schlieren of magnetite and chromite are found. Magnesite fills veins and brecciated zones. Thin veinlets of talc occur rarely,

The serpentine shows a wide range of grain sizes, colors and degrees of concentration of the magnetite dust into distinct spots. The serpentine is extremely broken, apparently due to the superposition of the regional shearing on the fracturing commonly accompanying serpentinization. Part of the abundant fractures is filled, mainly with calcite, amorphous light green serpentine and chrysotile «slipfiber».

The lamprophyres. The dunite is cut in a few places by darkgreen to black lamprophyres dikes, which are rarely more than a couple of feet wide. The contacts are sharp. The rocks are very fine grained and in one location contain albite and biotite filled vesicules.

In the serpentine no dikes were observed. Lamprophyric rocks appear here as lenses or lenticular layers, often with undulating contacts. These contacts have generally been the sites of strong differential movements. In some instances a series of small lenses suggests a sliced dike. In most cases the rocks have become schistly all through, conformable with the shears in the serpentine flowing

around them. The lenses are generally small, and few surpass 50 ft in length and 20 ft in thickness.

In contrast to the fresh dike rocks in the dunite, the lamprophyres forming the lenses in the serpentine have been strongly altered, probably affected by the agents which caused the serpentinization and shearing of their wall rocks. Altered lamprophyre was encountered in many drill holes, and there appears to be no difference in alteration to depths of 500 ft. The altered rock, furthermore, is especially susceptible to weathering so that outcrops are few and inconspicuous. The abundance of the lamprophyre lenses in the serpentine becomes clear only at a systematic investigation of the soil covered parts of the gully walls and shows up in trenches and drill holes.

Among the less altered rocks a range of varieties is recognized, reflecting both the variation in original composition and grain size, the degree of shearing and the extent of recrystallization. Small dark brown mica flakes are nearly always conspicuous. The commonest lamprophyre type is a brownish-gray, fine grained, amphibole rich rock with texture ranging from magmatic to schistosity. The rarely fresh and less abundant feldspar rich rocks are brownish-yellow, medium grained and usually have a gneissic aspect. Massive albitites, dark brown biotite schists and dark green, medium grained amphibolites are rare. Thin calcite veinlets are common. Other vein filling minerals are albite and a blue-green chlorite. Small flakes of this chlorite and of antigorite are characteristic for narrow zones both on the serpentine - and on the lamprophyre sides of sheared contacts.

Petrographical Data. It appears from a study of thin sections that the rocks described above which vary so much in aspect, are made of the same original constituents - though in different proportions - and must be all considered exponents of one lamprophyric magmatic phase.

The original magmatic texture has been lost in most cases due to kataklasis and recrystallization, but the latter process generally has not advanced enough to completely obscure the original mineral composition. Actinolitic hornblende, biotite and a sodic plagioclase were the predominant lamprophyre minerals with accessory apatite, rutile, magnetite and ilmenite.

The hornblende is probably the alteration product of a pyroxene of which no remnants remain. Characteristic pseudomorphs, if present, were destroyed by kataklasis and recrystallization: the green hornblende crystals appear often drawn out into streaks and

are rimmed, replaced or accompanied by a light bluish-green amphibole.

One finds the plagioclase recrystallized to a very fine grained mass of anhedral albite crystals, often with some epidote.

The biotite crystals also are often aligned by shearing - smeared out - or are recrystallized to a slightly paler variety.

Genesis

Lamprophyric rocks have been found only within the limits of the ultrabasic mass and appear to be completely lacking in the surrounding metamorphic sediments.

The shape of the rare lamprophyre bodies in the serpentine which have not been influenced by shearing is very irregular. Shafing and trenching allowed a complete three-dimensional picture of some pockets which appear as irregular inclusions and which were not interconnected.

The above observations, together with the small size of the dikes in the dunite, lead to the hypothesis that the solidification of the ultrabasic mass produced locally small amounts of a rest differentiate of lamprophyric composition which either cooled in place to form irregular pockets or was forced into the fractures of the surrounding ultrabasic to form thin cross-cutting dikes.

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Π Ε Ρ Ι Λ Η Ψ Ι Σ

Ἡ παρούσα ἀνακοίνωσις ἀποτελεῖ τμήμα εὐρύτερας κλίμακος μελετῶν τοῦ συγγραφέως περὶ τῆς ὑπερβασικῆς ἐκρηξιγενοῦς μάζης, τῆς κειμένης εἰς 25 χιλιομέτρων ἀπόστασιν ΝΝΑ τῆς Κοζάνης, μεταξὺ τῶν χωρίων Μικροβάλτου, Τρανοβάλτου καὶ Μονῆς Ζιδανίου, εἰς τὸ νότιον ὄριον τῆς νεογενοῦς λεκάνης Κοζάνης. Τῶν ὁρίων τῆς μάζης αὐτῆς δίδεται σύντομος περιγραφή.

Πετρολογικῶς διακρίνεται εἰς ἐσωτερικὸς πυρὴν ἐκ δουνίτου, μᾶλλον ἀδιατάρακτος τεκτονικῶς, καὶ εἰς περιφερειακὸς μανδύας ἐκ σερπεντίνου, ἰσχυρῶς παραμορφωμένου μέχρι σχιστοποιήσεως. Ἡ μετάβασις ἐκ τοῦ δουνίτου πρὸς σερπεντίνην εἶναι βαθμιαία. Ἐντὸς τοῦ σερπεντίνου πολλὰ ρήγματα πληροῦνται καὶ ἀπὸ χροσότιλον.

Οἱ λαμπροφῦραι συναντῶνται, εἰς μικρὰν κλίμακα, ἐντὸς τοῦ δουνίτου καὶ ἐντὸς τοῦ σερπεντίνου. Εἰς τὴν πρώτην περίπτωσιν, ὡς φλέβες ἐκ πετρώματος σκοτεινοχρόου ἀναλλοιώτου σχεδόν, εἰς τὴν δευτέραν περίπτωσιν ὡς φακοὶ ἢ παρακρίσεις κοίται ἐκ παραμορφωμένου καὶ ἁλλοιωμένου

λαμπροφύρου. Τὸ πάχος τῶν φλεβῶν σπανίως ὑπερβαίνει τὰ 0,60 μ., τὸ μήκος τῶν φακῶν σπανίως τὰ 15 μ. καὶ τὸ πάχος αὐτῶν τὰ 6 μ.

Κύρια ὄρυκτὰ τοῦ λαμπροφύρου εἶναι ἡ ἀκτινολιθική κεροσίλβη, ὁ βιοτίτης καὶ τὸ νατριοῦχον πλαγιόκλαστον, δευτερεύοντα τοιαῦτα ὁ ἀπατίτης, ὁ μαγνητίτης, ὁ ἱμενίτης. Ἐπιγενῆ ὄρυκτὰ κεροσίλβη κυανοπρασίνη, ἀλβίτης, ἐπίδοτον, ἀνοικτόχρους βιοτίτης, ἀσβεστίτης, ἀντιγορίτης. Προφανῶς ἡ κεροσίλβη (τὸ κύριον ὄρυκτὸν τοῦ πετρώματος) θὰ προέρχεται ἐξ ἑνὸς ἀρχικοῦ πυροξένου, τοῦ ὁποίου ὅμως σήμερον δὲν ὑφίστανται οὔτε ὑπόλοιπα οὔτε ψευδομορφώσεις.

Ἐπειδὴ οἱ λαμπροφῦραι ἀπαντοῦν μόνον εἰς τὴν περιφέρειαν τῆς ὑπερβασικῆς μάζης καὶ οὐδέποτε ἐντὸς τῶν περιβαλλόντων αὐτὴν μεταμορφωμένων πετρωμάτων καθίσταται προφανές, ὅτι ἐσχηματίσθησαν διὰ κρυσταλλώσεως ἑνὸς λαμπροφυρικήσ συστάσεως μαγματικοῦ ὑπολοίπου ἐντὸς τοῦ ὑπερβασικοῦ περιβάλλοντος, εἴτε ἐπιτοπίως (φακοί), εἴτε πιεσθέντες ἐντὸς τῶν ρηγμάτων τοῦ δουνίτου. Περὶ τούτου συνηγορεῖ καὶ τὸ μικρὸν μέγεθος τῶν ἐκ λαμπροφύρου σχηματισμῶν.

References :

1. BRUNN, J. H. — Contribution à l'étude géologique du Pinde Septentrional et d'une partie de la Macédoine Occidentale. *Annales géologiques des pays Helléniques*, 7, 1956.
2. ZACHOS, C. — Chromite deposits of Vourinon (Kozani) area. From: *The Mineral Wealth of Greece*. Vol. III, 1953, p. 47—82.

SUR L'AGE SENONIEN SUPÉRIEUR DE CERTAINES FORMATIONS DETRITIQUES DANS LE MASSIF DU PAÏKON (MACÉDOINE - GRÈCE)

P A R

JACQUES MERCIER

Entre la vallée de Moglena à l'W et la vallée de l'Axiös (Vardar) à l'E se dresse, au-dessus de la plaine marécageuse de Janitza (Jennidze Vardar), le massif du Païkon (Pajik). Ce massif se situe dans la zone du Vardar définie par F. KOSSMAT¹ elle-même comprise entre la zone pélagonienne à l'W et la zone du Rhodope à l'E.

La zone pélagonienne est caractérisée par la présence d'affleurements cristallins et d'une couverture sédimentaire conservée à la faveur de certains ensellements. Ces affleurements cristallins forment le

1. KOSSMAT F. (1924) : Geologie der zentralen Balkan-Halbinsel. Die Kriegschanplätze 1914 - 18, geologisch dargestellt, Helf 12, Berlin.