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PECTOLITE IN MICA PERIDOTITE, WOODSON COUNTY, KANSAS*

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Pectolite has been identified by optical and *x*-ray diffraction techniques as a major constituent in the groundmass of one facies of the Hills Pond peridotite, section 32, T. 26 S., R. 15 E., Woodson County, Kansas. The occurrence of pectolite as a major component of the groundmass of a facies of peridotite seemingly is unique. Pectolite has been recognized as a secondary mineral in cavities and seams in mafic eruptive rocks as at Weehawken and Patterson, New Jersey, and as a minor component in syenitic rocks as at Hot Springs, Arkansas and in the Kola Peninsula, U.S.S.R. (Dana and Ford, 1932, p. 567). Some pectolite has been found

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where serpentinized ultramafic rocks have been intruded by younger, less mafic rocks (Bloxam, 1954, p. 527; Parsons, 1924, p. 55–57). Further, pectolite has been reported in South African kimberlite (Mountain, 1931, p. 70–74) as encrustation on less mafic foreign inclusions, on slickenside surfaces bounding the kimberlite pipes, and locally as isolated spheres and tufts in the kimberlite.

The Hills Pond peridotite has been mapped by Wagner (1954). It crops out in the center of a gentle dome and is bounded on the north by a fault. Sills of the peridotite finger from the main body of peridotite along the fault southward into Pennsylvanian shale, limestone, and sandstone. Thin-section studies of samples of the peridotite taken from both the outcrop and diamond-drill core show that, in most places, the rock is a serpentinized mica peridotite containing about 25 per cent phlogopite and less than 10 per cent each of olivine remnants, diopsidic augite, and pleochroic, light-red-brown amphibole as phenocrysts in the serpentine groundmass. Minor constituents include apatite, magnetite, and perovskite. Locally in the subsurface, the rock has a groundmass that is composed almost completely of fine-grained phlogopite and contains phenocrysts of the major constituents given above. At the surface, the serpentine groundmass has weathered in large part to nontronite (?), and the phlogopite has weathered to a mixed-layer vermiculite mineral.

The pectolite was found in a thin-section of peridotite core samples from a sill that is at least 30 feet thick and whose top is at a depth of 765 feet. The upper 10 feet of the sill, which intrudes dark-gray Galesburg shale (Pennsylvanian), contains pectolite as a major component of the groundmass. Directly below the pectolitic rock, the sill holds phenocrysts of amphibole, augite, and olivine in a groundmass composed mainly of very fine grained phlogopite. The groundmass of the sill gradually becomes serpentinitic with depth.

The rock containing the pectolite is light gray and speckled with light-brown phlogopite. In thin section it is seen that the rock contains about 40 per cent phlogopite as subhedral books measuring as much as 2 mm. in length and as smaller fragments in the groundmass that measure as little as 0.025 mm. in length. The phlogopite has reversed absorption ($X > Y > Z$) and the books commonly have frayed ends that are intergrown with pectolite in the groundmass. The groundmass includes 1 or 2 per cent perovskite as anhedral patches or blebs as large as 0.1 mm. in diameter. The perovskite grains are surrounded by subcircular patches of a brown, radially fibrous carbonate (dolomite(?)) as much as 0.3 mm. in diameter that is clouded by leucoxene. The patches of dolomite(?) approximate 8 per cent of the rock, and seemingly have replaced other components of the groundmass. Trace amounts of magnetite as anhedral grains measuring less than 0.03 mm. in diameter are scattered through

TABLE 1. *d*-VALUES IN ANGSTROMS OF *X*-RAY REFLECTIONS FROM PECTOLITE SAMPLES FROM HILLS POND PERIDOTITE, SECTION 32, T. 26 S., R. 15 E., WOODSON COUNTY, KANSAS, AND FROM PATTERSON, NEW JERSEY. DATA OBTAINED USING GENERAL ELECTRIC DEBYE-SCHERER CAMERA (14.32 CM. DIAMETER) AND CuKα RADIATION

d Å	Relative intensity estimated	*d* Å	Relative intensity estimated	*d* Å	Relative intensity estimated
7.82	<1–1	1.94	<1–1	1.35	<1–1
7.02	<1–1	1.92	<1–1	1.29	<1–1
5.50	1	1.88	1	1.28	<1
3.90	3	1.83	1	1.24	<1–1
3.50	2	1.77	<1–1	1.166	<1–1
3.31	5	1.75	3	1.133	<1–1
3.28	2	1.71	3	1.101	<1–1
3.08	6*	1.67	<1–1	1.089	<1–1
2.92	10	1.66	1	1.080	<1
2.74	3	1.60	1	1.062	<1
2.59	3	1.56	<1–1	1.040	<1
2.43	1	1.55	2	0.995	<1–1
2.33	1	1.52	<1–1	0.921	<1
2.31	1	1.49	1	0.884	<1
2.17	3**	1.47	2	0.866	<1
2.09	<1–1	1.39	<1–1	0.852	<1
2.00	1	1.37	1		

* Skewed to 3.15A.
** Doublet (?)

parts of the groundmass and as inclusions in the phlogopite books. About 3 per cent of the rock is nontronite(?) (identification as a montmorillonite confirmed by *x*-ray diffraction), which occurs as green patches measuring as much as 2 mm. in length and in which minute, strongly birefringent flakes are discernible. Melilite, which constitutes not more than 1 per cent of the rock, is present in the groundmass as 0.8-mm. patches of squarish uniaxial negative grains and as disseminated individuals measuring 0.01 to 0.25 mm. across. The birefringence (about 0.007) and negative sign indicate that the melilite may have a composition near that of gehlenite. Much of the groundmass (about 20 per cent of the rock) is composed of a very fine grained, turbid aggregate showing low birefringence; it contains a montmorillonite mineral (confirmed by *x*-ray diffraction), and locally has structure suggestive of the former presence of melilite. The turbid groundmass locally grades into pectolite.

Pectolite, which approximates 25 per cent of the rock, is the major component of the groundmass. It occurs as sheaflike and radial aggregates of fibers and blades that locally penetrate into the phlogopite

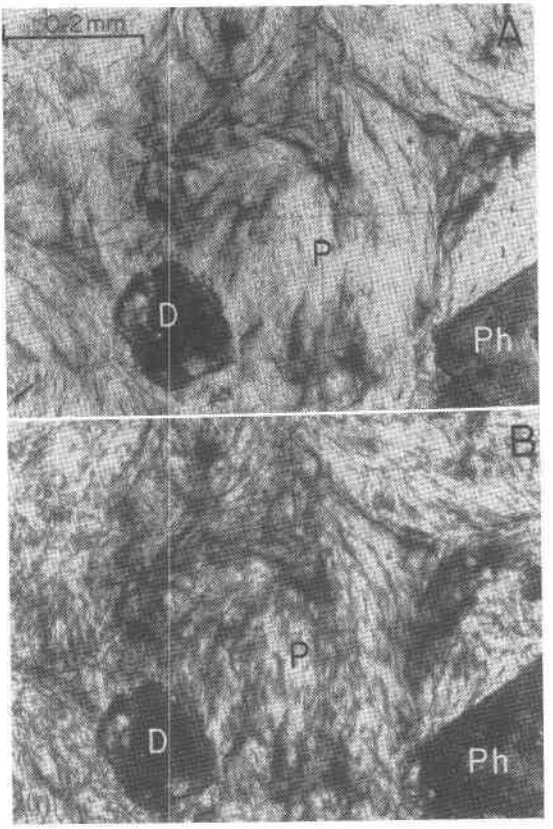

FIG. 1. Photomicrographs of pectolite-bearing rock, section 32, T. 26 S., R. 15 E., Woodson County, Kansas. A, plane-polarized light; B, crossed nicols. D, dolomite (?) clouded by leucoxene; P, pectolite; Ph, phlogopite.

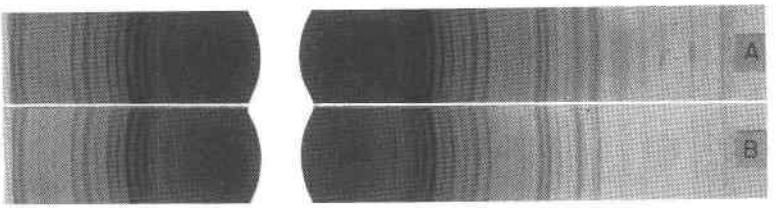

FIG. 2. *X*-ray powder films of pectolite. A, sample from section 32, T. 26 S., R. 15 E., Woodson County, Kansas; B, sample from Patterson, New Jersey.

books along cleavage traces and that grade into the turbid argillic part of the groundmass (Fig. 1). The blades and fibers range in length from nearly submicroscopic sizes to as much as 2 mm. Maximum width of the blades is about 0.1 mm. The blades and fibers have positive elongation, imperfect nearly parallel extinction, and strong birefringence (about 0.04), and are optically positive with moderate 2V. Locally they show cleavage that is both nearly parallel to and nearly normal to the length of the fibers. N_x is about 1.60, N_z about 1.64.

Comparison of *x*-ray powder films (Fig. 2) of pectolite from the peridotite with films of pectolite from Patterson, New Jersey, confirmed optical identification. *d*- values and intensities of the *x*-ray reflections (Table 1) for both the pectolite from the Hills Pond peridotite and the New Jersey sample proved identical.

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A PENETRATION-TWIN IN OLIVINE

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A porphyritic alkali basalt (A.U. thin-section 3560) from Khyber Pass, Auckland, contains numerous euhedra of olivine set in a finely felted groundmass of plagioclase, pyroxene, magnetite and glass. The olivine phenocrysts range in size up to 0.9 by 0.5 mm. and vary in composition from Fo_{84} to Fo_{90}. Their habit is fairly constant, the commonest combination of forms being $\{010\}+\{110\}\pm\{120\}$, together with $\{101\}+\{021\}$. True twinning was observed only in the one grain herein described, but the thin-section also contains euhedral olivine with "translation lamellae" oriented parallel to (100).