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PRIDERITE-BEARING XENOLITHS FROM THE PRAIRIE CREEK MICA PERIDOTITE, ARKANSAS

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ABSTRACT

Mica peridotites from the Prairie Creek intrusion, Arkansas, contain xenoliths composed of diopside and titanian potassian richterite plus accessory priderite. Composite reaction coronas have been developed around the xenoliths during their transport in the mica peridotite magma. The coronas consist of an inner armoring rim of diopside and an outer rim of diopside, titanian phlogopite and richterite. The composition of the priderite, phlogopite (TiO_2 4.6%, Al_2O_3 7–8%, MgO 21–22%) and amphibole (TiO_2 3–5%, K_2O 5%) is similar to that of the same phases in potassic rocks (wolgidite, orendite); the compositions differ from those found in amphibole-bearing xenoliths in kimberlites. The host rock contains poikiloblastic plates of titanian phlogopite and richterite and also has affinities with potassic rocks (madupite) rather than kimberlite. The xenoliths are interpreted to be fragments of a rock formed by the high-pressure crystallization of a potassic magma sampled by a subsequent intrusion of mica peridotite.

Keywords: priderite, titanian potassian richterite, ultrapotassic rocks, kimberlite, Prairie Creek (Arkansas).

SOMMAIRE

Les péridotites à mica de l'intrusion de Prairie Creek (Arkansas) renferment des xénolithes composés de diopside et de richtérite titanifère et potassifère avec pridérite comme élément accessoire. Des couronnes de réaction composites se sont formées autour des xénolithes durant leur transport dans le magma péridotitique. Les couronnes comprennent une bordure interne de diopside et une bordure externe composée de diopside, phlogopite titanifère et richtérite. La composition de la pridérite, de la phlogopite (TiO_2 4.6%, Al_2O_3 7–8%, MgO 21–22%) et de l'amphibole (TiO_2 3–5%, K_2O 5%) est semblable à celles des mêmes phases dans les roches potassiques (wolgidite, orendite) et diffère de celle des minéraux qu'on rencontre dans les xénolithes à amphibole des kimberlites. La roche encaissante contient des plaquettes poeciloblastiques de phlogopite titanifère et de richtérite et présente aussi des affinités avec les roches potassiques (madupite) plutôt qu'avec la kimberlite. On considère les xénolithes comme fragments d'une roche provenant de la cristallisation à haute pression d'un magma potassique, recueillis par l'intrusion subséquente de la péridotite à mica.

(Traduit par la Rédaction)

Mots-clés: pridérite, richtérite titanifère et potassifère, roches ultrapotassiques, kimberlite, Prairie Creek (Arkansas).

INTRODUCTION

The Prairie Creek diatreme, occurring near Murfreesboro, Pike County, Arkansas, has been described most recently by Meyer (1976) and Meyer *et al.* (1977). The intrusive body contains at least three lithologies, a breccia, a tuff and a massive mica peridotite. The breccia phase has long been known as a source of diamond (Miser & Ross 1923), and it is largely on the basis of the occurrence of this mineral that the diatreme has been regarded as a kimberlite. However, modern detailed mineralogical studies (Meyer *et al.* 1977, Lewis 1977) indicate that none of the phases of the intrusion correspond in detail to modern definitions of kimberlite, as proposed by Skinner & Clement (1979) or Mitchell (1979).

Notably absent at Prairie Creek are xenoliths (and xenocrysts) of mantle-derived garnet lherzolite and eclogite and megacrysts of magnesian ilmenite, which are characteristic of many kimberlites. A search of the diatreme has revealed, apart from country-rock xenoliths, the presence of only some unusual mafic xenolithic rocks that contain the rare minerals priderite and titanian potassian richterite. These mafic xenoliths, which form the subject of this paper, occur exclusively in the mica peridotite, where they are locally abundant.

Priderite $(K,Ba)_{1.5}Ti_8O_{16}$ (Norrish 1951) is a rare mineral that occurs exclusively in ultrapotassic rocks, such as the leucite lamproites of

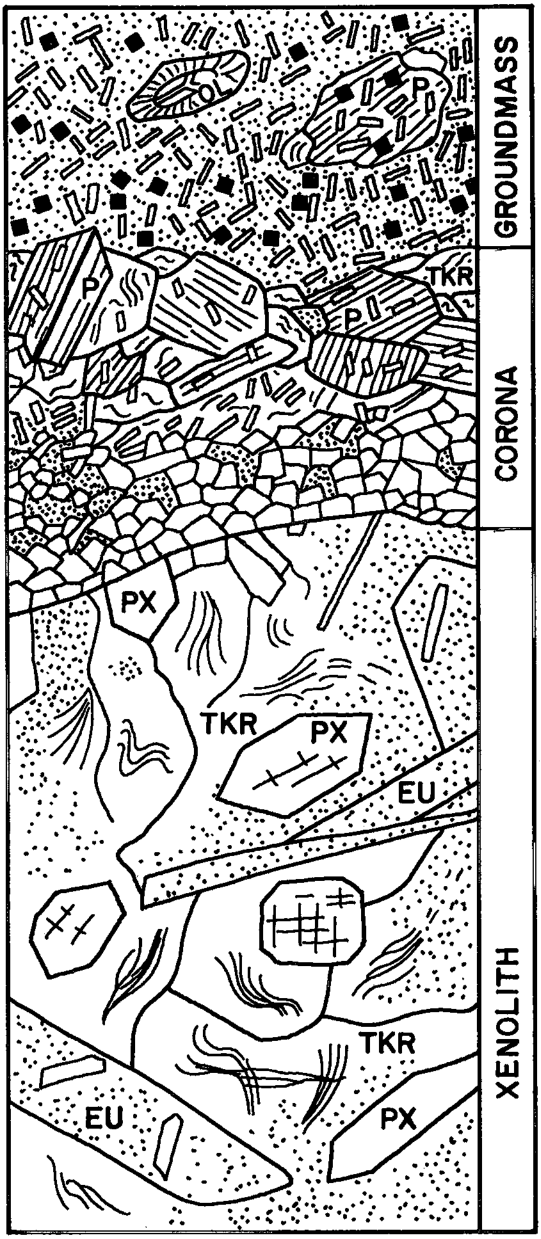

FIG. 1. Textures observable in a typical xenolith and its corona. The corona shown here is about 2 mm in width. Within the xenolith the clear euhedral mineral is diopside (PX). Bands of fluid inclusions are shown schematically in fresh and altered (stippled) amphibole (TKR). The altered euhedral phase (EU) in the xenolith is shown stippled. In the corona, anhedral and euhedral crystals of pyroxene (clear) coexist with fresh and altered (stippled) amphibole and phlogopite (P). In the groundmass occur rectangular prisms of pyroxene (clear), euhedra of spinel (black), poikilitic phlogopite (P) and altered olivine phenocrysts (OL). The groundmass (stippled) is altered amphibole.

West Kimberley, Australia (Prider 1960). Its presence in the Prairie Creek mica peridotite has important implications with regard to the petrological affinities of this intrusion. This is only the second known occurrence of priderite and titanian potassian richterite in North America. Previously, these minerals were known to occur only at the Leucite Hills, Wyoming (Carmichael 1967).

PETROGRAPHY OF THE XENOLITHS

The rounded dark grey xenoliths do not exceed 2 cm in diameter and are characterized by thin (2 mm) white rims. Petrographic examination reveals that each xenolith consists of a uniform core of coarse mafic material mantled by a composite corona consisting of two zones, the outermost being gradational with the groundmass of the host mica peridotite. Figure 1 illustrates the textural relationships observable in a typical xenolith.

Xenolith cores

The xenolith cores are coarse-grained igneous rocks with a panidiomorphic texture (Fig. 1). A high proportion of the xenolith (50–70%) consists of light greenish yellow pseudomorphs after a euhedral prismatic mineral that is considered to have been amphibole. In some xenoliths, elongate prisms of amphibole are rimmed by a light greenish yellow secondary phase petrographically and chemically (see below) identical to that of the euhedral pseudomorphs. Diopside (5–15%) is found as euhedral crystals set within the groundmass. The diopside is colorless, alteration-free and simply twinned. The above phases are set in a poikilitic matrix of amphibole and its alteration products (20–40%). Fresh amphibole is strongly pleochroic from pink to pinkish yellow and contains large numbers of vermiform inclusions of fluid. Optically the amphibole is identical to titanian potassian richterite (manganophyllite) described by Wade & Prider (1940). The amphibole is altered to a light greenish yellow secondary phase similar to that seen in the euhedral pseudomorphs. The fluid inclusions can be traced as relics in the alteration zones of some examples. Petrographic continuity between the altered groundmass amphibole and the euhedral pseudomorphs is commonly observed. An essentially opaque phase showing a deep brownish red pleochroism at the margins of thin grains, identified as priderite (see below) occurs as poikilitic plates (0–1%) intergrown with the groundmass amphibole. Phlogopite, olivine, its alteration products, spinel and perovskite are absent from the xenoliths. In summary, the xenoliths are characterized by an assemblage of pyroxene and amphibole with accessory priderite.

Coronas

Each xenolith is rimmed by a composite corona consisting of an inner zone (1 mm) of pyroxene and an outer zone (1 mm) of phlogopite, amphibole and minor pyroxene (Fig. 1). The inner zone consists of colorless pyroxene that forms a continuous rim around the xenolith core. Such pyroxene grains commonly are prismatic crystals whose major axes are aligned perpendicularly to the xenolith margin. Minor (10% or less) altered and fresh plates of amphibole occur interstitially. Gradation to the outer zone is represented by increasing amounts of amphibole, a decrease in the size and abundance of pyroxene coupled with a change in habit from interlocking crystals to isolated small euhedral crystals, and by the appearance of phlogopite (Fig. 1). The phlogopite grains are strongly pleochroic from light orange to deep reddish orange and form subhedral to anhedral plates poikilitically enclosing pyroxene microlites. In some examples, the phlogopite plates form a nearly continuous band at the margins of the outer corona. Where fresh, the amphibole is pink to yellow pink and, in some cases, poikilitically encloses the subhedral mica. Such amphibole grains contain relatively few pyroxene microlites and form relatively large plates. The amphibole alters to a light greenish yellow material. Both the fresh and altered amphiboles are identical in appearance to their counterparts in the xenolith cores. Vermiform inclusions of fluid are common.

Host mica peridotite

The coronas grade petrographically into the mica peridotite groundmass by the disappearance of mica, a decrease in grain size of the amphibole, and the appearance of spinel and perovskite.

The mica peridotite host contains phenocrysts of olivine (Fo_{91-93}) and its alteration products set in a fine-grained matrix, the most distinctive characteristic of which is the presence of large poikilitic plates of strongly pleochroic phlogopite. This phlogopite is identical to that found in the coronas in its pleochroism and content of pyroxene microlites. It differs, however, in also poikilitically enclosing grains of spinel and perovskite. The latter minerals, together with pyroxene, are also abundant throughout the groundmass, where they are set in a light greenish yellow mesostasis. This mesostasis is petrographically and chemically similar to the alteration products of the amphibole found in the xenoliths. In addition, *fresh* pink amphibole can be found in the mesostasis, especially adjacent to the phlogopite plates. Evidently, amphibole was an abundant groundmass phase before alteration. Groundmass amphibole has not previously been recognized in the Prairie Creek mica peridotite.

MINERAL COMPOSITION

Silicates were analyzed using the Purdue University MAC 500 automated wavelength-dispersion microprobe and the Bence–Albee method of data correction. Priderite was analyzed using the Dalhousie University Cambridge Mk.V wavelength-dispersion microprobe and the EMPADR VII full ZAF correction procedure. The Ba analytical peak was corrected for Ti interference.

Table 1 presents representative compositions of pyroxene and indicates that, regardless of

TABLE 1. REPRESENTATIVE COMPOSITIONS OF PYROXENE

	1	2	3	4	5	6	7	8	9	10	11	12
SiO_2	54.1	53.7	54.2	53.9	53.9	54.3	55.1	53.9	53.4	54.6	54.2	55.0
TiO_2	0.8	0.9	0.7	0.9	0.9	0.6	0.5	1.0	1.0	0.4	0.7	0.4
Al_2O_3	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.4	0.6
Cr_2O_3	0.2	0.0	0.1	0.2	0.2	0.0	0.0	0.3	0.3	0.7	0.1	0.7
FeO*	2.6	2.7	2.7	2.2	2.8	3.3	2.9	2.1	2.2	3.5	3.5	3.7
MnO	0.1	0.1	0.2	0.1	0.0	0.1	0.1	0.1	0.1	n.d.	n.d.	0.0
MgO	17.6	17.4	18.0	17.6	17.1	16.9	17.2	17.7	18.0	17.4	17.0	18.5
CaO	24.5	24.8	23.9	24.0	23.8	23.9	24.2	24.5	24.2	22.6	23.9	19.2
Na_2O	0.3	0.4	0.5	0.4	0.7	0.1	0.2	0.2	0.2	0.6	0.3	1.1
	100.3	100.1	100.4	99.4	99.6	99.4	100.4	99.9	99.5	100.0	100.1	99.2

*Total Fe expressed as FeO. Values expressed in wt.%.
1-2 euhedral diopsides in xenolith; 3-4 euhedral prisms in reaction rims; 5 groundmass prism in mica peridotite; 6-7 wyomingite, Leucite Hills (Carmichael 1967); 7-9 wolgidite, Mt. North, W. Australia; 10-11 means of cores and rims of groundmass diopsides, Roberts Victor kimberlite (Dawson et al. 1977); 12 average diopside MARID xenolith (Dawson & Smith 1977)

TABLE 2. REPRESENTATIVE COMPOSITIONS OF TITANIAN POTASSIAN RICHTERITE

	1	2	3	4	5	6	7	8	9	10	11
SiO_2	52.9	51.8	52.4	52.1	53.6	53.4	54.7	52.6	52.5	55.4	54.2
TiO_2	3.4	5.1	4.1	4.4	3.5	3.4	6.2	5.8	5.3	0.5	0.6
Al_2O_3	0.6	0.6	0.4	0.9	0.8	0.6	0.6	0.5	0.5	1.0	1.1
Cr_2O_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1
FeO*	3.7	3.6	3.8	3.4	3.2	3.4	2.5	5.8	3.5	2.3	4.2
MnO	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	n.d.	0.1
MgO	21.2	21.2	21.1	21.0	21.2	21.1	18.3	18.1	21.1	22.9	21.5
CaO	6.4	5.9	5.9	6.7	6.3	6.5	6.1	6.3	6.3	6.7	6.2
Na_2O	4.0	4.1	4.6	3.9	4.4	3.9	3.6	3.4	3.8	2.8	3.9
K_2O	4.9	5.0	5.1	4.9	5.0	5.1	6.0	5.2	5.1	4.6	5.3
BaO	0.1	0.3	0.4	0.2	0.0	0.4	0.3	n.d.	n.d.	n.d.	n.d.
	97.3	97.7	97.9	97.5	98.1	97.9	98.4	97.8	98.0	97.7	97.2

*Total Fe expressed as FeO. Values expressed in wt.%.
1-2 Amphibole in xenoliths, PrairieCreek; 3-4 amphibole in reaction rims, Prairie Creek; 5-6 amphibole in mica peridotite groundmass, Prairie Creek; 7 orendite Leucite Hills, Wyoming (Carmichael 1967); 8 wolgidite, Mt. North, W. Kimberley; 9 Rice Hill, W. Kimberley; 10 Average of 22 primary metasomatic amphiboles in lherzolites (Erlank and Rickard 1977); 11 amphibole in MARID xenolith (Dawson & Smith 1977).

paragenesis, it is a Ti-, Al- and Cr-poor diopside showing very little compositional variation. The Prairie Creek pyroxene is similar to pyroxenes in leucite lamproites, micaceous kimberlites and MARID-suite xenoliths from kimberlites (Table 1).

Table 2 indicates that regardless of paragenesis, the Prairie Creek amphibole is of similar composition and is a titanian potassian richterite characterized by 3 to 5 wt. % TiO_2 and *circa* 5.0 wt. % K_2O. Amphiboles of this composition are exceedingly rare and are known only from potassic rocks such as the leucite lamproites of West Kimberley, Australia (Wade & Prider 1940), wyomingite and orendite of the Leucite Hills, Wyoming (Carmichael 1967), jumillite of Murcia, Spain (Lopez Ruiz & Rodriquez Badiola 1980) and leucite lavas of New South Wales, Australia (Cundari 1973). Table 2 shows that the Prairie Creek amphibole compositions are similar to those from such potassic rocks but are very different from potassic richterites found in lherzolites and MARID-suite xenoliths associated with kimberlites. These latter amphiboles are characteristically TiO_2-poor (<1%, Table 2). The Prairie Creek amphibole is typically altered, regardless of paragenesis, to an amorphous material of relatively constant composition (SiO_2 41–43%, TiO_2 0–3%, Al_2O_3 4–5%, FeO_T 6–9%, MgO 22–24%, K_2O 3–4%, BaO 1.0%, CaO, Na_2O, NiO and MnO all less than 0.5%).

TABLE 3. COMPOSITION OF PRIDERITE

	TiO_2	FeO*	MgO	BaO	K_2O	TOTAL
1	72.2	11.3	1.0	6.7	9.1	100.3
2	70.9	11.0	1.0	8.9	7.9	99.7
3	72.6	11.0	0.8	5.0	9.7	99.1
4	72.3	11.1	0.9	6.1	9.3	99.7
5	72.1	10.9	1.0	7.0	8.8	99.8
6	71.9	11.0	1.0	7.8	8.4	100.1
7	67.8	12.6	0.8	13.1	5.0	99.3
8	73.3	11.4	0.9	5.8	7.4	98.8
9	72.6	11.1	1.3	7.4	7.4	99.8
10	73.8	8.7	1.8	6.3	8.7	99.3
11	76.3	9.5	1.1	5.0	7.1	99.0

*Total Fe expressed as FeO. Values expressed in wt.%.
1-2 ARK-3, Prairie Creek, Arkansas
3-6 ARK-5, Prairie Creek, Arkansas
7 orendite, Wyoming (Carmichael 1967)
8 wolgidite, Mt. North (Carmichael 1967)
9 wolgidite, Wolgidee Hills, this work
10 wolgidite, Rice Hill, this work
11 wolgidite, Mt. North, this work

Table 3 presents representative compositions of priderite; these show minor compositional variation within and between grains with regard to BaO and K_2O content. Priderite of broadly similar composition (Table 3) has previously been described only from wyomingite and orendite of the Leucite Hills, Wyoming (Carmichael 1967) and the West Australian leucite lamproites (Norrish 1951, Prider 1960).

Table 4 presents data for phlogopite that indicate that reaction-rim phlogopite and poikilitic groundmass phlogopite have similar compositions. The mica is unusual in having high BaO

TABLE 4. REPRESENTATIVE COMPOSITIONS OF PHLOGOPITE

	1	2	3	4	5	6	7	8	9
SiO_2	42.3	40.8	42.5	41.8	41.9	43.2	42.8	42.2	43.5
TiO_2	4.7	6.3	5.6	6.0	2.0	8.4	6.1	1.1	2.3
Al_2O_3	6.9	7.0	6.0	7.9	11.5	7.2	9.9	10.6	8.8
Cr_2O_3	0.2	0.1	0.0	0.1	0.6	0.0	0.3	0.2	0.2
FeO*	7.2	7.8	7.7	6.7	2.7	8.1	3.7	5.9	8.7
MnO	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
MgO	22.7	21.4	21.9	21.9	25.2	17.6	23.4	24.8	21.3
CaO	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.1
Na_2O	0.5	0.6	1.0	0.6	0.1	0.3	0.1	0.2	0.1
K_2O	9.5	9.2	9.7	9.3	10.6	10.3	10.1	10.5	10.2
BaO	1.9	2.1	1.9	2.4	0.8	0.8	0.2	n.d.	n.d.
	95.9	95.4	96.4	96.7	95.7	95.9	96.5	95.5	95.2

*Total Fe expressed as FeO. Values expressed in wt.%.
1-2 Reaction rim mica, Prairie Creek; 3-4 groundmass mica in mica peridotite, Prairie Creek; 5. Average of 12 Leucite Hills micas (Carmichael 1967); 6-7 wolgidite Mt. North (Mitchell 1981); 8-9 MARID xenolith mica (Dawson & Smith 1977).

and TiO_2 contents and low Al_2O_3 contents coupled with high MgO, features that are characteristic only of phlogopite from leucite lamproites (Mitchell 1981). MARID-suite mica and primary and secondary phlogopite found in lherzolite xenoliths in kimberlite differ from the Prairie Creek mica in being TiO_2-poor and Al_2O_3-rich (Dawson & Smith 1977, Delaney *et al.* 1980). The Prairie Creek micas also differ from micas occurring as phenocryst or groundmass phases in kimberlites; these micas are typically rich in Al_2O_3 and contain 0.5–2.0% Cr_2O_3 (Mitchell & Meyer 1980, Smith *et al.* 1978).

DISCUSSION

The assemblage of priderite, titanian potassian richterite and diopside is extremely rare. Priderite and titanian potassian richterite are minerals that have only been found in potassic rocks such as wolgidite, mamillite, jumillite, orendite and wyomingite. The mineral compositions and paragenesis observed in the Prairie Creek xenoliths and their petrographic similarities to potassic rocks, especially the occurrence of late-stage poikilitic richterite, demonstrate clearly that they have petrological affinities with the above potassic rocks. Petrographically, the xenoliths have no exact counterparts with any of the rocks described from regions of potassic magmatism (Carmichael 1967, Wade & Prider 1940) and, in particular, lack leucite or its pseudomorphs. The absence of leucite, however, can be attributed to its suppression as a liquidus phase by crystallization at high pressure under water-rich conditions. Leucite-free rocks that are similar to the xenoliths have been described by Prider (1939, 1960) from pegmatitic zones in the Wolgidee Hills, West Kimberley. Most of the leucite-bearing potassic rocks so far described are high-level volcanic or hypabyssal rocks; the Prairie Creek xenoliths might be examples of the type of rocks that would develop by slow crystallization of potassic magmas at depth. Xenoliths with mineralogical affinities to potassic rocks have never been found in kimberlites (Dawson 1981). Where amphibole is found in xenoliths in kimberlites, it is either clearly metasomatic or is present in a very different paragenesis, *e.g.*, in the MARID-suite, as well as being deficient in TiO_2 relative to richterite compositions from potassic rocks. In summary, the xenoliths are considered to represent potassic magmas that crystallized at depth to a coarse-grained rock related to wolgidite or orendite. Such bodies were subsequently fragmented and incorporated into the Prairie Creek mica peridotite, which carried them as xenoliths to higher levels in the crust.

The development of coronas around the xenoliths indicates that they were not in equilibrium with their transporting medium. Any attempt by a magma to assimilate such xenoliths would result in precipitation of the phases then on the liquidus. Accordingly, we consider that the inner corona of pyroxene was developed during attempted assimilation, with the precipitated pyroxene serving to armor the xenolith and to prevent complete assimilation. This pyroxene rim then acted as a nucleation point for the growth of later phlogopite and amphibole, resulting in the formation of the outer corona. Apart from the absence of spinel and perovskite in the corona, there is no mineralogical difference between the outer corona and the mica peridotite groundmass. The corona is merely coarser grained.

The magma that transported the xenoliths has now crystallized to the assemblage olivine, pyroxene, spinel, perovskite, phlogopite, amphibole and its alteration products. Petrographically, the rock is unique amongst described kimberlites (Skinner & Clement 1979, Mitchell 1979, Dawson 1980). The presence of groundmass titanian potassian richterite and BaO- and TiO_2-rich, Al_2O_3-deficient phlogopite, together with the priderite-bearing xenoliths, indicates affinities with ultra potassic rocks rather than kimberlite. On a purely petrographic basis the rock should be termed a richterite-bearing madupite, as the "mica peridotite" has strong petrographic and mineralogical similarities to madupite described from Pilot Butte, Wyoming (Cross 1897). The presence of diamond has no importance in current definitions of kimberlite, and its occurrence in the tuffaceous rocks of the Prairie Creek intrusion should not be given undue emphasis in describing the "mica peridotite". It should be realized that diamond can occur in any mantle-derived rock formed within the stability field of diamond. Wendlandt & Eggler (1980) have recently shown that madupite liquids can form at such pressures (24–34 kbar).

In conclusion, the Prairie Creek "mica-peridotite" contains xenoliths of priderite-bearing diopside – titanian potassian richterite rocks that have affinities with ultrapotassic rocks. These xenoliths have reacted with the host magma that itself has crystallized to a richterite madupite.

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References

Carmichael, I.S.E. (1967): The mineralogy and petrology of the volcanic rocks from the Leucite Hills, Wyoming. *Contr. Mineral. Petrology* **15**, 24-66.

Cross, W. (1897): Igneous rocks of the Leucite Hills and Pilot Butte, Wyoming. *Amer. J. Sci.* **154**, 115-141.

Cundari, A. (1973): Petrology of the leucite-bearing lavas in New South Wales. *Geol. Soc. Aust. J.* **20**, 465-492.

Dawson, J.B. (1980): *Kimberlites and Their Xenoliths*. Springer-Verlag, New York.

——— & Smith, J.V. (1977): The MARID (mica–amphibole–rutile–ilmenite–diopside) suite of xenoliths in kimberlite. *Geochim. Cosmochim. Acta* **41**, 309-323.

———, ——— & Hervig, R.L. (1977): Late-stage diopside in kimberlite groundmass. *Neues Jahrb. Mineral. Monatsh.*, 529-543.

Delaney, J.S., Smith, J.V., Carswell, D.A. & Dawson, J.B. (1980): Chemistry of micas from kimberlites and xenoliths. II. Primary and secondary textured micas from peridotite xenoliths. *Geochim. Cosmochim. Acta* **44**, 857-872.

Erlank, A.J. & Rickard, R.S. (1977): Potassic richterite-bearing peridotites from kimberlite and the evidence they provide for upper-mantle metasomatism. *Proc. 2nd Int. Kimberlite Conf. (Santa Fe), extended abstr. (unpaginated).*

Lewis, R.D. (1977). *Mineralogy, Petrology and Geophysical Aspects of the Prairie Creek Kimberlite, near Murfreesboro, Arkansas.* M.Sc. thesis, Purdue Univ., West Lafayette, Indiana.

Lopez Ruiz, J. & Rodriguez Badiola, E. (1980): La region volcanica neogena del sureste de España. *Estudios Geol.* **36**, 5-63.

Meyer, H.O.A. (1976): Kimberlites of the continental United States: a review. *J. Geol.* **84**, 377-403.

———, Lewis, R.D., Bolivar, S. & Brookins, D.G. (1977): Prairie Creek kimberlite, Murfreesboro, Pike County, Askansas. *Field Guide, 2nd Int. Kimberlite Conf. (Santa Fe).*

Miser, H.D. & Ross, C.S. (1923): Diamond-bearing peridotite in Pike County, Arkansas. *U.S. Geol. Surv. Bull.* **735**, 279-322.

Mitchell, R.H. (1979): The alleged kimberlite–carbonatite relationship: additional contrary mineralogical evidence. *Amer. J. Sci.* **279**, 570-589.

——— (1981): Titaniferous phlogopites from the leucite lamproites of the West Kimberley area, Western Australia. *Contr. Mineral. Petrology* **76**, 243-251.

——— & Meyer, H.O.A. (1980): Mineralogy of micaceous kimberlite from the Jos dyke, Somerset Island, N.W.T. *Can. Mineral.* **18**, 241-250.

Norrish, K. (1951): Priderite, a new mineral from the leucite-lamproites of the West Kimberley area, Western Australia. *Mineral. Mag.* **29**, 496-501.

Prider, R.T. (1939): Some minerals from the leucite-rich rocks of the West Kimberley area, Western Australia. *Mineral Mag.* **25**, 373-387.

——— (1960). The leucite lamproites of the Fitzroy Basin, Western Australia. *Geol. Soc. Aust. J.* **6**, 71-118.

Skinner, E.M.W. & Clement, C.R. (1979): Mineralogical classification of Southern African kimberlites. *In* Kimberlites, Diatremes and Diamonds: their Geology, Petrology and Geochemistry (F.R. Boyd & H.O.A. Meyer, eds.) *Proc. 2nd Int. Kimberlite Conf. (Santa Fe)* **1**, 129-139.

Smith, J.V., Brennesholtz, R. & Dawson, J.B. (1978): Chemistry of micas from kimberlites and xenoliths. I. Micaceous kimberlites. *Geochim. Cosmochim. Acta* **42**, 959-971.

Wade, A. & Prider, R.T. (1940): The leucite-bearing rocks of the West Kimberley area, Western Australia. *Quart. J. Geol. Soc. London* **96**, 39-98.

Wendlandt, R.F. & Eggler, D.H. (1980): The origins of potassic magmas. I. Melting relations in the systems $KAlSiO_4$–Mg_2SiO_4–SiO_2 and $KAlSiO_4$–MgO–SiO_2–CO_2 to 30 kilobars. *Amer. J. Sci.* **280**, 385-420.

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