THE ULTRABASIC POTASSIC ROCKS OF PRESIDENTE OLEGARIO, SERRA DA MATA DA CORDA, MINAS GERAIS, BRAZIL.

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Ultrabasic potassic-ultrapotassic rocks are generally included in one of three groups: kimberlites, lamproites and kamafugites. Petrographically, the distinction between these groups seems relatively simple. The fragmental texture of kimberlites contrasts with the volcanic features found in lamproites and kamafugites. The latter two can be further identified by the presence (or absence) of some typical minerals.

This straightforward scheme, however, is blurred by examples of mineralogical and chemical convergence, as shown by similarities between micaceous kimberlites and lamproites. or by cases in which mineralogy seems to point to one of the rock groups while chemistry points to another.

Such a situation was found during studies on the rocks of the Presidente Olegário pipe.

Ultrabasic potassic rocks -tuffs, lavas and small intrusions, mapped as the Patos facies of the Mata da Corda Group- occur as isolated outcrops on dissected plateaus in the Serra da Mata da Corda, western Minas Gerais State. They invade Late Cretaceous sandstones over an area of about 4500 Km^2. Outcrops are generally poor, largely because of agriculture. Fertile clays, derived from the Patos tuffs and lavas, cover the plateaus and are frequently capped by a 1- to 5-m-thick iron crust formed by weathering.

The Presidente Olegário pipe, observed along a newer road-cut near the city of the same name, also belongs to this ultrabasic volcanic province. It is composed of a sequence of massive and amygdaloidal lavas and tuffs, cut by centimetric altered dikes and tuffisitic breccias.

The lapilli and ash tuffs contain cogenetic and accidental material. Some pyroclastic horizons also present rounded fragments of variable size of two different types: a) volcanic.rocks with abundant phenocrysts of altered melilite(?) (Suite I); b) fresh, medium to coarse-grained, banded clinopyroxenites (Suite II) with diopside, perovskite, titanomagnetite, apatite, schorlomite, titanite, Ba-rich K-feldspar (BaO=3%) and wadeite.

The lavas are porphyritic with subidiomorphic pheno- and microphenocrysts of olivine (Fo=90) in a matrix of diopside, perovskite, Mg-ilmenite (MgO=5.0-8.6%), titanomagnetite, apatite, poikilitic Ti-phlogopite (TiO_2=4.6-6.0%) and Ti-K richterite (K_2O=5.0, TiO_2=3.4%) within a glassy base containing Mg, Ca, K and Ba.

Chemical analyses of the massive lavas indicate an ultrabasic potassic composition (Table 1). The rocks are also metaluminous, rich in Ti and with rather low mg values. They present high amounts of incompatible elements, mainly Ba. REE are abundant (Table 1) and show a steep distribution pattern (Fig. 1): La/Yb ratios are high and the Eu anomaly is absent.

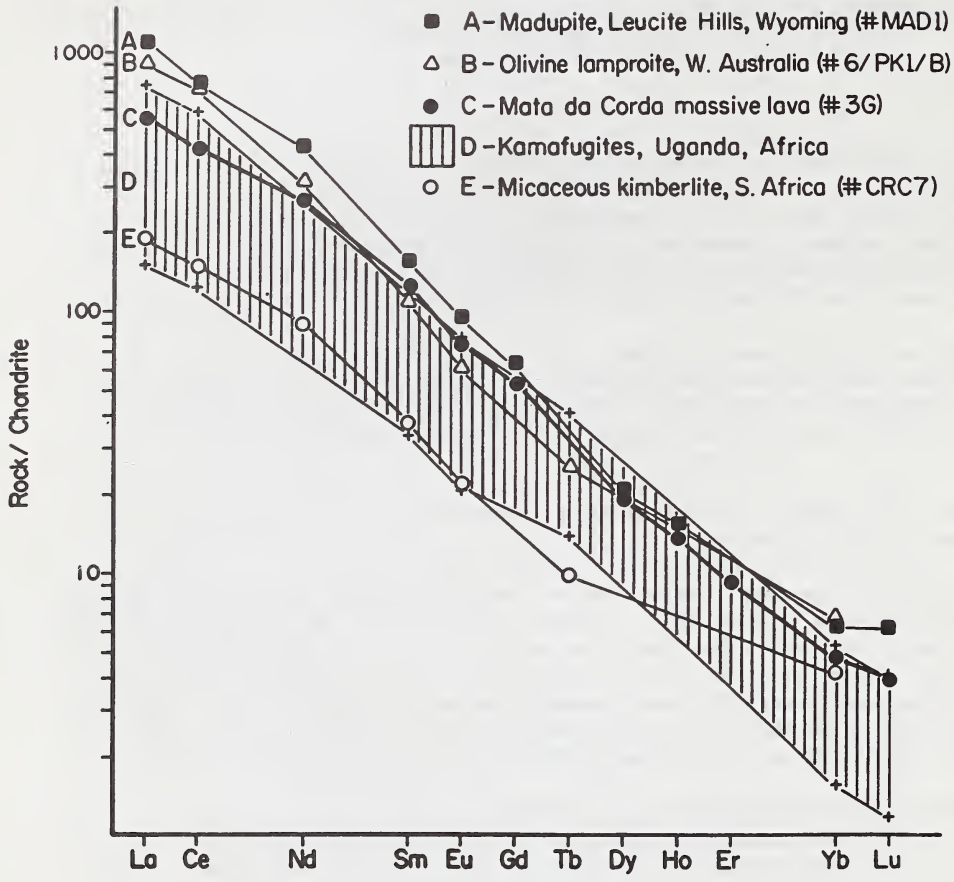

Fig. 1. Chondrite normalized REE diagram showing REE abundance in an ultrabasic potassic rock from Presidente Olegário, Serra da Mata da Corda compared to basic-ultrabasic lamproites, a micaceous kimberlite and kamafugites. The kamafugitic field includes data for katungites and mafurites (higher REE contents) and ugandites (lower REE contents). Sources: A-Thompson, R.N. et al. 1984. Phil.Trans.R.Soc.Lond. A310, 549-590. B, E-Fraser, K.J. et al. 1985/86. Earth planet.Sci.Lett. 76, 57-70. C-this work. D-Mitchell, R.H. & Bell, K. 1976. Contr.Mineral.Petrol. 58, 293-303

Acknowledgements - Support for field and laboratory work came from the Brazilian agencies CNPq and FINEP (FINEP-USP. Proc. 42.86.0491.00).

The mineralogy and texture of these lavas resemble those of ultrabasic lamproites, a resemblance enhanced by their high Ba content and the coexistence with fragments containing wadeite (Suite II). Major element chemistry, however, indicates a kamafugitic affinity. Also, the possible presence of melilite in the Suite I fragments, whose emplacement was certainly related to the eruption of the lavas, may point to a kamafugitic association; it is unknown in lamproitic occurrences. Contents of REE in ultrabasic potassic rocks are usually high, but they show a regional variability that seems to be related to differences in mantle source material and/or petrogenetic behavior; they share a somewhat steep and continuous distribution pattern (high La/Yb values, Fig.1). The distribution pattern for the Presidente Olegário lava (curve C, Fig.1) is similar both in profile and abundance to some kamafugites (mafurites and katungites) and olivine lamproites (Fig.1); it also is, as generally observed elsewhere, enriched in REE when compared to kimberlites.

The lavas thus present features that straddle the supposedly clear-cut characteristics defined in the literature as being "typical" of kamafugites and ultrabasic lamproites

Table I: Chemical analyses of Presidente Olegário, Serra da Mata da Corda massive lavas

Sample	3G	3G1	87-04		3G	3G1	87-04
wt%				ppm			
SiO_2	39.1	37.2	38.9	Ba	10748	11644	11656
TiO_2	6.0	6.6	6.5	Rb	150	150	160
Al_2O_3	5.6	5.3	5.0	Cs	n.a.	<10	<10
Fe_2O_3	8.6	5.9	6.1	Sr	1250	1310	1650
FeO	4.67	6.8	7.0	Zr	710	790	800
MnO	0.19	0.18	0.17	Nb	200	192	33
MgO	17.1	18.4	15.0	Y	30	38	62
CaO	10.1	10.6	11.6	V	200	n.a.	n.a.
Na_2O	0.75	0.81	0.56	Cr	752	570	650
K_2O	2.3	2.2	1.7	Co	n.a.	80	66
P_2O_5	0.47	0.5	0.49	Ni	338	440	270
H_2O+	3.05	3.73	4.67	Cl	<20	110	93
CO_2	0.6	0.3	0.45				
S	0.07	0.08	0.05	La	173	153	183
F	0.24	0.21	0.19	Ce	348	294	340
rest	1.73	1.83	1.86	Nd	159	147	168
				Sm	23.4	19.2	28.86
less O=F,S	0.14	0.13	0.10	Eu	5.5	4.24	5.15
				Gd	13.4	10.98	13.46
sum	100.43	100.21	100.14	Dy	6.2	4.8	6.05
				Ho	1.0	0.7	1.01
# mg^1	0.74	0.76	0.72	Er	2.0	1.58	2.40
(Na+K)/Al	0.66	0.70	0.55	Yb	1.0	0.91	1.09
K_2O/Na_2O^2	2.0	1.80	2.0	Lu	0.13	0.10	0.18

1: # mg=Mg/(Mg+Fe^{2+}) calculated with Fe_2O_3/FeO ratio of 0.2;
2: molar ratio; n.a.=not analised.
Analyst: C. Dutra, GEOLAB, Belo Horizonte, Minas Gerais, Brazil.