PETROGRAPHY AND GENERAL CHEMICAL FEATURES OF POTASSIC MAFIC TO ULTRAMAFIC ALKALINE VOLCANIC ROCKS OF MATA DA CORDA FORMATION, MINAS GERAIS STATE, BRAZIL.

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INTRODUCTION

This abstract focuses on relevant petrographic and chemical features of kamafugitic lavas of the Mata da Corda formation, cropping out near the town of Carmo do Paranaiba (western Minas Gerais state). The studied area (approximately, 450 km^2) constitutes part of the Cretaceous Sanfranciscan basin.

GEOLOGY

The rock succession in the Sanfranciscan basin represented by the Areado (hereafter called AR) and Mata da Corda (hereafter called MT) formations, is 500 m thick and unconformably overlies folded metapelites of the Upper Proterozoic Bambui group. The AR formation (Lower Cretaceous) consists of fluvial polymictic conglomerates (Abaete member), lacustrine shales, sandstones, limestones and marls (Quirico member), and aeolian and fluvio-deltaic sandstones (Tres Barras member). The MT formation (Upper Cretaceous) overlies the latter formation, from which is separated by local erosive unconformities. It comprises a 40 to 60 m thick pile of K-rich mafic to ultramafic alkaline lavas (Patos facies), volcanic conglomerates and sandstones (Capacete facies) and clayey sandstones with little volcanic contribution (Urucuia facies). The lavas and non-volcanoclastic rocks have a larger spatial distribution and are volumetrically more significant than the volcanoclastic rocks. The lavas form small exposures (frequently, very weathered) of massive, thin horizontal and subhorizontal, poorly-vesiculated flows (in places, individually, not exceeding 0.5 m thick). In some outcrops, the extrapolated thickness of a sequence of flows may reach 10 m.

PETROGRAPHY

Under the IUGS scheme (Streckeisen, 1980) the MT lavas are ultramafitites, mafitites, leucitites and kalsilitites (hereafter, called, respectively ULT, MAF, LEU and KAL). These ULT and MAF have unidentified felsic phase(s) and estimated values (vol. %) of mafic index from 80 to 70 and 60 to 70, respectively; whereas the LEU and KAL contain leucite (pseudomorphs) and kalsilite (pseudomorphs and fresh and clear grains), and get their names from that felsic phase present in larger amount. In addition, the lavas are all feldspar-free, with abundant clinopyroxene (mostly, diopside), perowskite and Ti- magnetite, and very fine to medium-grained porphyritic to seriated textures. An interstitial material is always present and often intensely altered to zeolites and clay minerals. In some rocks it has been determined as kalsilite based on electron microprobe analysis; but in other rocks this material could not be accurately identified and it has been modally considered as an unidentified felsic phase.

The ULT and MAF are porphyritic to seriated rocks. The porphyritic types show phenocrysts (up to 20 vol.%, and 0.2 to 2.0 mm in size) of olivine (Fo_{91-85}), clinopyroxene (diopside), perowskite, Ti-magnetite, melilite (euhedral and subhedral pseudomorphs), apatite and phlogopite (rarely, as 3.0 mm large plates). The very fine to fine-grained groundmass has clinopyroxene (diopside,up to 50%), Ti-magnetite, perowskite unidentified interstitial material, and may also contain minor amounts of phlogopite and apatite. The seriated types have coarser grains but are modally and mineralogically akin to the previous types.

The LEU and KAL are very similar fine to medium-grained rocks, very frequently, with a typical seriated texture. Some of them, however, may develop textures which resemble those of the ULT and MAF Mineralogically, The LEU and KAL are similar to the latter groups of rock, with the exception that they contain leucite (subhedral pseudomorphs) and kalsilite (euhedral pseudomorphs and/or anhedral fresh grains). Both feldspathoids occur as essential phases in the seriated LEU and KAL or in the very fine-grained intergranular groundmass of the porphyritic LEU. In these porphyritic rocks, the feldspathoids, in spite of being found in the groundmass, are absent from the phenocrysts and microphenocrysts, which consist of clinopyroxene (diopside to salite), Ti- magnetite, apatite and perowskite.

The above mentioned rocks (usually, the fine-grained types) may contain scarce and small (mostly, < 20 mm across) cognate inclusions of fine to medium-grained cumulate rocks, consisting of diopside, perowskite, Ti-magnetite, phlogopite and kalsilite. Most commonly, the inclusions are of kalsilite pyroxenites, but more rarely, perowskite modally dominates and they become kalsilite "*perowskitites*". In both cases, kalsilite is an interstitial phase.

CHEMISTRY

Twenty-three samples of the MT lavas have been chemically analised (results not fully given). These data indicate that: (1) the lavas are all ultrabasic and the majority falls into two distinct groups (GI and GII), according to the K_2O/Na_2O and K_2O values. GI is potassic and has (WT%) SiO_2=38-42, TiO_2=5-7, Al_2O_3=5-8, Fe_2O_3>4<5, FeO=8-9, MgO=8-14, CaO=11-17, K_2O=1-3, and Na_2O>0-2; whereas GII is ultrapotassic, with (WT%) SiO_2=43-45, TiO_2=5-6, Al_2O_3=7-9, Fe_2O_3>3<4, FeO=7-9, MgO=6-9, CaO=8-12, K_2O= 4-7 and Na_2O>0-2. (2) In the Na_2O+K_2O versus SiO_2 plot, the compositions delineate a broad trend from moderately (GI) to strongly (GII) alkaline. (3) The compositional spectrum of the lavas shows mainly non-linear variation trends of increasing SiO_2 Al_2O_3, K_2O, Na_2O, Nb, Zr and Y, and decreasing FeO, CaO, Cr and Co, with decreasing MgO. (4) Discrimination diagrams using SiO_2, CaO, MgO, and FeO (total iron) exhibit most lava compositions in fields of kamafugitic affinity.

SUMMARY AND CONCLUSIONS

The evidence on the Mata da Corda (MT) lavas in this work suggests that: (1) Because of the uncertainties in the mineralogy and modal analysis it is difficult to establish a clear correspondance between petrographic and chemical (potassic and ultrapotassic) groups for these lavas. (2) The observed chemical compositional variations of the lavas are consistent with an evolutionary general trend from potassic, Mg-richer and moderately alkaline to ultrapotassic, Mg-poorer and strongly alkaline members. Low-pressure crystal fractionation of clinopyroxene, olivine, perowskite and magnetite, probably controlled this trend. (3) Cretaceous "lamproites" (Leonardos *et al.*, 1990) and kimberlites and lamprophyres (Svisero *et al.* 1979) have been reported in the general region, but the available petrography, mineralogy and chemistry of the Cretaceous K-rich MT lavas, in the area, are more compatible with a kamafugitic affinity.

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