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SHORT COMMUNICATIONS

Chemistry of Phlogopite Megacrysts in Majhgawan Diamondiferous Pipe, Panna, Madhya Pradesh

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The phlogopite megacrysts of Majhgawan diatreme have been grouped into two groups and from the inspection of the chemical analysis of micas their origin are discussed.

The Majhgawan diatreme which is located 15 km WSW of Panna town is emplaced into the Baghain sandstone formation of Kaimur Group of Vindhyan Super Group and a tectonic platformal cover of the Central Indian Peninsular Shield. The diatreme is a downward tapering cone shaped body measuring 515x335 (m) in plan with a pear shaped configuration. The contact with the host Baghain sandstone is determined by drilling and dips at a fairly constant angle of 70° inwards. The upper portion of the diatreme i.e., from 370 to 344 MSL is highly weathered yellow(ish) tuffaceous material. At lower levels with increasing depth the rock becomes hard and darkgrey in colour. In the literature, Majhgawan pipe has been described as kimberlite. However, based on detailed petrological observations, Scot Smith described it as olivine lamproitic lapillituff. Various mineralogical and geochemical aspects of Majhgawan pipe studied by Chatterjee and Rao (1995) indicated that it is an intermediate variety between kimberlite and lamproite. The micaceous pipe rock consists of megacrysts of olivine, phlogopite, ilmenite, pyrope and enstatite set in a matrix which is mainly made up of serpentine and calcite. Phlogopite mica occurs as megacrysts and also as a constituent of the ground mass.

On the basis of shape it has been found that there are two different types of megacrysts. They vary in size from 3.5 mm to 2 cm and were classed into two groups, namely Group

Table I. Compositions of the phlogopite megacrysts of Majhgawan diatreme.

	MAJ 3	MAJ 4	MAJ 11	MAJ 12
SiO_2	38.470	37.670	37.810	37.330
Al_2O_3	11.630	11.330	11.420	11.360
FeO	2.990	4.500	4.600	5.110
MgO	21.910	22.390	21.890	22.980
MnO	0.000	0.000	0.000	0.020
Cr_2O_3	0.890	0.760	0.620	0.580
TiO_2	6.330	6.400	6.020	6.130
Na_2O	0.000	0.120	0.050	0.110
K_2O	9.930	10.450	10.050	9.740
CaO	0.020	0.000	0.000	0.000
BaO	0.690	0.520	0.830	0.790

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Table I Contd.....

	MAJ 3	MAJ 4	MAJ 11	MAJ 12
Based on 22 oxygen				
Si	5.6481	5.5260	5.5830	5.4610
Al	2.009	1.9360	1.9823	1.9540
Fe	0.3656	0.5500	0.5661	0.6230
Mg	4.8250	4.9260	4.8489	5.0490
Mn	0.0000	0.0000	0.0000	0.0025
Cr	0.1040	0.0880	0.0726	0.0667
Ti	0.6969	0.7040	0.6671	0.6725
Na	0.0000	0.0334	0.0142	0.1352
K	1.8607	1.9570	1.8940	1.8192
Ca	0.0035	0.0000	0.0000	0.0000
Ba	0.0044	0.0350	0.0478	0.0457

A and Group B. The Group A megacrysts are rounded and commonly deformed. Megacrysts of Group B in contrast are rectangular and free from deformation. Some of the Group A megacrysts also show resorption phenomenon. The compositions of the four selected phlogopite megacrysts are given in Table I. All the analyses were made by electron micro probe techniques at the BRGM laboratories in France. The megacrysts are highly magnesian (>20% MgO) and have variable amounts of FeO and Cr_2O_3.

In Fig.1, FeO wt% is plotted against Cr_2O_3 wt% for phlogopite micas of Majhgawan as well as for micas of kimberlites from Lesotho and South Africa (Carswell, 1975) and micas of perioditic xenoliths in kimberlites (Dawson and Smith, 1975). From the inspection of the

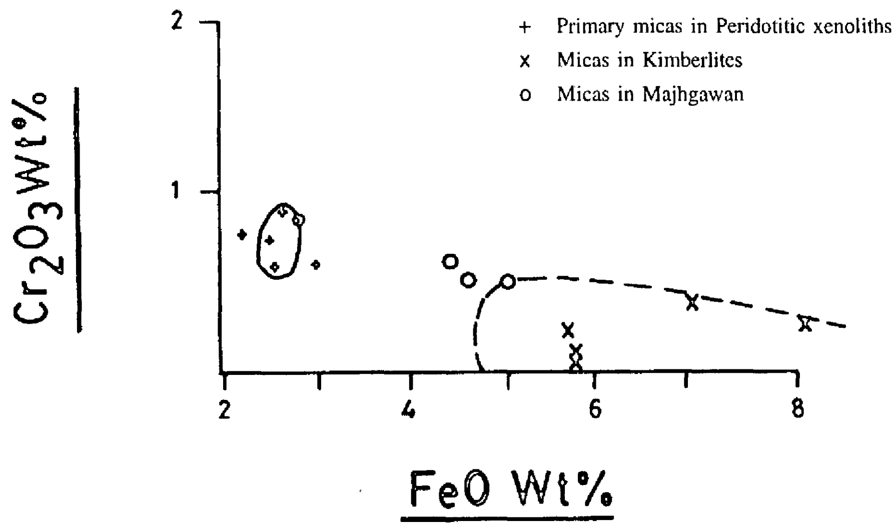

Fig.1. Cr_2O_3 *Vs* FeO plots.

chemical analysis of micas, it can be seen that there is a difference between them. The Group A megacryst (No.MAJ3) has lower FeO wt% and falls within, or very close to the field of primary lherzolotic micas, and hence might be interpreted as being derived by fragmentation of peridotites containing primary micas. The Group B megacrysts (Nos. MAJ 4, MSJ 11 and MAJ 12) have higher values of FeO wt% that chemically resembles mica megacrysts in kimberlite. In general two main groups of phlogopite megacrysts were recognized in kimberlites. (Carswell, 1975). The first group contains >0.5 wt% Cr_2O_3 and <3.7 wt%. FeO

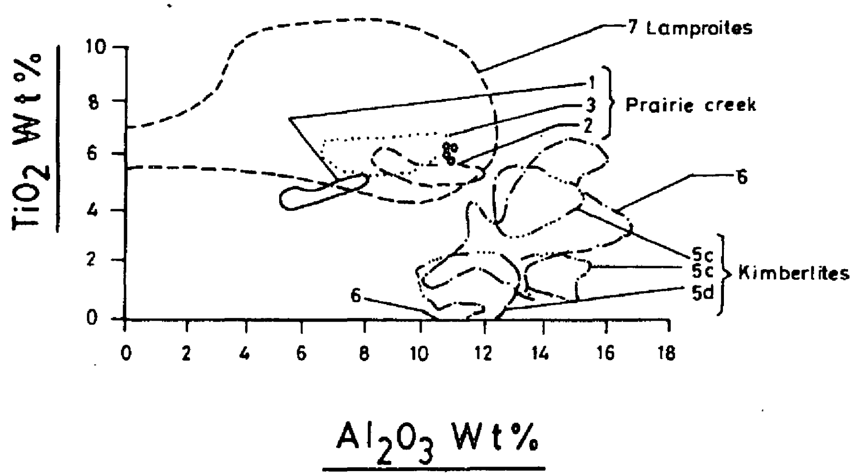

Fig.2. TiO_2 *Vs* Al_2O_3 plots (Field 1 = Hypabyssal, 2= Phlogopite rich lapilli from both "volcanic breccias and tuffs",3= Phlogopite poor lapilli from both "volcanic breccias and tuffs", 4= Hypabyssal, 5 (a,b,c)= Kimberlites, 6= Kimberlite dykes, 7= Lamproites; reference after, Scot Smith, 1984).

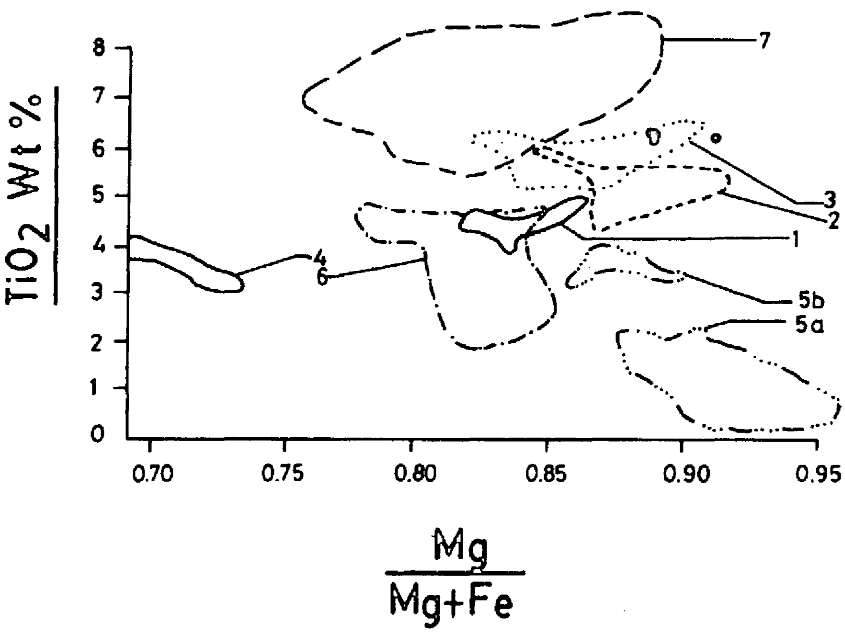

Fig.3. TiO_2 *Vs* Mg/Mg+Fe plots.

and is considered chemically similar to the primary micas in peridolite xenoliths in kimberlites. The other group comprises megacrysts containing <0.7 wt% Cr_2O_3, <12 wt% Al_2O_3 and >3.7 wt% FeO and is considered similar to those micas found in kimberlites. The Figs.2 and 3 show that the Majhgawan phlogopites are not similar in composition to those from typical kimberlites. The TiO_2 values of phlogopites show lamproitic trend (Scot Smith, 1992). The Majhgawan phlogopites, however, fall either within the compositional field of phlogopites from lamproites on in the part of the field close to the kimberlites (Fig.3) or intermediate between the kimberlites and lamproite fields.

In Summary, two distinctive groups of phlogopite megacrysts have been recognized in Majhgawan, namely chromium rich peridotite derived micas and chromium poor megacrysts. The distinction between the two is important when using the megacrysts for dating purposes, as an analysis of a sample consisting of undiscriminated megacrysts may or may not yield an uniform age data.

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