# DIAMONDIFEROUS KIMBERLITE OF THE WAJRAKHARUR AREA, SOUTHERN INDIA.

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Although diamond has been known in India from antiquity the presence of kimberlite has been the subject of much speculation and controversy. However, in the late 19th Century igneous rocks, supposedly the hosts of diamond at Panna and Wajrakharur were described, but were discounted as being kimberlite (Foote, 1889; Lake, 1890). Subsequently, others studied the source of diamonds (Picamuthu and Rao, 1932; Mathur and Singa, 1963; and Mehr, 1953) but generally considered that kimberlite was not present. However, in 1963 Rao and Phadtre after examining the geology and petrography for four igneous bodies near Wajrakharur, Andhra Pradesh concluded they were kimberlitic. We report here preliminary data on the mineralogy and mineral chemistry of phases from two of these diatremes and confirm the conclusion of Rao and Phadtre that these are kimberlites.

Four pipe-like bodies are located in the region of Wajrakharur; two are near this village and the other two are near Lattavaram, about 6 miles SSW of Wajrakharur. The bodies are somewhat oval in shape, trending roughly N70$^{o}$E, and have intruded pre-cambrian granite and gneiss. The material in the pipes is highly weathered near the surface and consists of serpentine, calcite, clay minerals and fragments of crustal and local host country-rock.

At Lattavaram the kimberlite is somewhat more durable and compact than at Wajrakharur and it is thus possible to distinguish slight mineralogical and petrographic differences between the two pipes. Rao and Phadtre (1963) report the occurrence of eclogite and peridotite xenoliths from this locality but unfortunately we have not yet been able to confirm this observation. For the most part xenoliths consist of amphibolite or other crustal fragments.

Petrographically the two kimberlites near Lattavaram are distinct. One kimberlite (L1) consists of relatively small (average about 1 mm) phenocrysts of olivine in a very dark, fine grained matrix of serpentine, calcite, phlogopite and magnetite-rich spinel. Minor monticellite and pectolite were also noted. Spinels in this rock appear to be of two types - a minor number are rich in chromium (7-11 wt% $Cr_2O_3$) whereas the second group have generally about 2-4 wt% $Cr_2O_3$.

The second kimberlite at Lattavaram (L2) is much more coarsely grained than L1. The phenocrysts of olivine are larger and more abundant although they are for the most part serpentinized. Ilmenite and garnet, the latter with very thick kelyphitic rims, are also present in this kimberlite. The ground mass consists predominantly of serpentine, calcite, minor phlogopite and opaque phases,

including spinel and ilmenite. Minor phases such as sphene and perovskite have also been observed.

Chemical analyses of various phases from the two kimberlites at Lattavaram are presented in Tables 1 and 2. The analyzed olivine in L1 is generally close to $Fo_{92}$ whereas that in L2 ranges between $Fo_{88}$ and $Fo_{92}$. The garnets in L2 kimberlite are predominantly pyrope with subsidiary almandine and grossular. $Cr_2O_3$ is approximately 2.5 - 3.0 wt% in these garnets which are also relatively low in CaO(~5 wt%). The ilmenites so far analyzed vary in chromium content with some containing up to 4 wt% $Cr_2O_3$. These ilmenites rich in $Cr_2O_3$ also contain high amounts of MgO relative to the Cr-poor ilmenites.

Serpentinized olivine phenocrysts in L1 kimberlite are interesting in that the veins of serpentine contain numerous minute needles of a nickel sulfide phase. A maximum content of 72 wt% Ni was obtained for this mineral which strongly suggests it is heazelwoodite ($Ni_3S_2$). The occurrence of this phase is believed to be due to late stage sulfurization of the olivine, accompanying serpentinization, with the Ni being derived from the original olivine (0.2 - 0.3 wt% NiO).

The geological occurrence, plus the petrographic character of these rocks, and the similarity of mineral compositions with other known kimberlites are sufficient evidence to support Rao and Phadtre (1963) in their conclusion that these are true kimberlites.

References

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Table 1. Representative analyses of minerals from Lattavaram-1 kimberlite.

| | Olivine | Spinel (1) | Spinel (2) | Monti-cellite | Pecto-lite | Serpen-tine |
|---|---|---|---|---|---|---|
| $SiO_2$ | 41.50 | - | - | 37.25 | 52.40 | 42.57 |
| $TiO_2$ | 0.02 | 9.80 | 7.32 | 0.27 | 0.04 | 0.02 |
| $Al_2O_3$ | - | 0.95 | 1.17 | 0.06 | 0.50 | 0.97 |
| $Cr_2O_3$ | 0.09 | 2.63 | 10.69 | - | 0.04 | 0.13 |
| FeO | 7.84 | 79.25 | 71.94 | 8.05 | 0.52 | 1.07 |
| MgO | 50.86 | 6.69 | 7.16 | 21.63 | 0.23 | 39.46 |
| CaO | 0.10 | - | - | 32.46 | 33.73 | 0.77 |
| MnO | 0.12 | 0.54 | 0.58 | 0.29 | 0.13 | 0.23 |
| $Na_2O$ | - | - | - | 0.06 | 9.34 | 0.09 |
| $K_2O$ | - | - | - | 0.05 | 0.04 | 0.05 |
| NiO | 0.34 | - | - | 0.02 | 0.01 | - |
| Co | - | 0.12 | 0.14 | - | - | - |
| Cu | - | 0.07 | 0.03 | - | - | - |
| Total | 100.87 | 100.05 | 99.03 | 100.14 | 96.99 (+OH) | 85.36 (+OH) |

Table 2. Representative analyses of minerals in Lattavaram-2 kimberlite.

| | Olivine | Garnet | Ilmenite (1) | Ilmenite (2) | Phlo-gopite | Serpen-tine | Sphene |
|---|---|---|---|---|---|---|---|
| $SiO_2$ | 41.28 | 42.77 | 0.24 | 0.16 | 39.92 | 42.42 | 29.71 |
| $TiO_2$ | 0.05 | 0.11 | 53.37 | 53.18 | 0.58 | 0.05 | 37.08 |
| $Al_2O_3$ | 0.02 | 21.53 | 0.30 | 0.38 | 13.64 | 0.74 | 1.34 |
| $Cr_2O_3$ | 0.06 | 2.82 | 4.03 | 0.79 | 0.03 | 0.02 | - |
| FeO | 11.23 | 7.58 | 23.73 | 35.48 | 2.80 | 4.32 | 1.66 |
| MgO | 43.23 | 21.28 | 16.43 | 10.08 | 25.67 | 37.76 | 0.13 |
| CaO | 0.21 | 4.48 | 0.34 | 0.02 | 0.01 | 0.12 | 27.53 |
| MnO | 0.15 | 0.36 | 0.54 | 0.25 | 0.02 | 0.20 | 0.05 |
| $Na_2O$ | 0.03 | - | 0.01 | 0.06 | - | - | - |
| $K_2O$ | - | - | - | - | 10.10 | - | 0.01 |
| NiO | 0.23 | - | 0.05 | - | 0.01 | 0.19 | 0.01 |
| Total | 101.49 | 100.93 | 99.04 | 100.39 | 92.78 (+OH) | 85.82 (+OH) | 97.52 |