# MINERALOGY OF PERIDOTITE XENOLITHS FROM THE MIR KIMBERLITE, YAKUTIA, RUSSIA

Roden[1], M.F., Laz'ko[2], E.E., Ponomarenko[2], A.I., Serenko[3], V.P.

1. Dept. of Geology, University of Georgia, Athens, GA 30602, USA
2. Institute of Ore Deposit Geology, Petrography, Mineralogy & Geochemistry (IGEM), Russian Academy of Sciences, Moscow 109017, Russia
3. Yakutian Geological Research and Exploration Dept., Almazy Rossii-Sakha Co. Ltd., Mirniy 678170 Yakutia, Russia

The Paleozoic Mir kimberlite pipe is one of the several hundred kimberlite diatremes which constitute the Yakutian province of the Siberian platform in eastern Siberia (Sobolev, 1985). At this pipe, garnet-bearing inclusions are common and are dominated by relatively coarse-grained garnet peridotites which have olivine grains > 1 mm across in contrast to uncommon sheared garnet peridotites which have pyroxene, garnet and olivine porphyroclasts in a matrix of olivine neoblasts < 100 micrometers across. Additionally, spinel- and ilmenite-bearing peridotites, ilmenite-clinopyroxene intergrowths, eclogites and different pyroxenites occur (Vladimirov et al., 1976; Spetsius, Serenko, 1990). We used the electron microprobe to characterize mineral compositions of representative coarse and sheared garnet peridotites, garnet websterites and orthopyroxenites, spinel websterites and ilmenite-bearing garnet wherlite xenoliths.

The bulk of the samples are Mg-rich as evidenced by the olivine compositions ($Fo_{89-92}$) in the peridotites (Fig. 1) and the pyroxene compositions (Mg#>90) in the

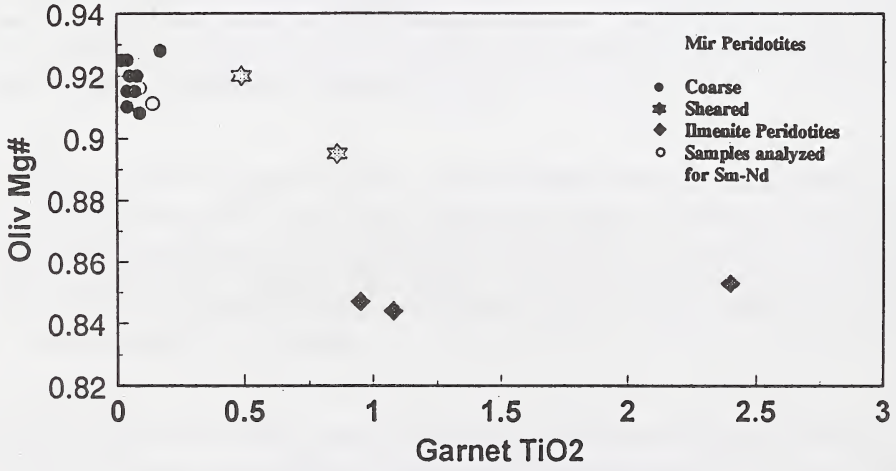


Fig. 1. Olivine and garnet compositions as a function of texture

pyroxenites. Exceptions to this generalization are two ilmenite-bearing garnet wherlites which have more Fe-rich olivine ($Fo_{84-85}$) and one garnet websterite with relatively Fe-rich orthopyroxene (Mg#=85). All the garnets in these inclusions are relatively CaO-rich and plot along the lherzolite trend indicative of saturation with clinopyroxene (Fig. 2). Although some garnets are zoned with respect to Cr, Ti and Fe, pyroxenes are

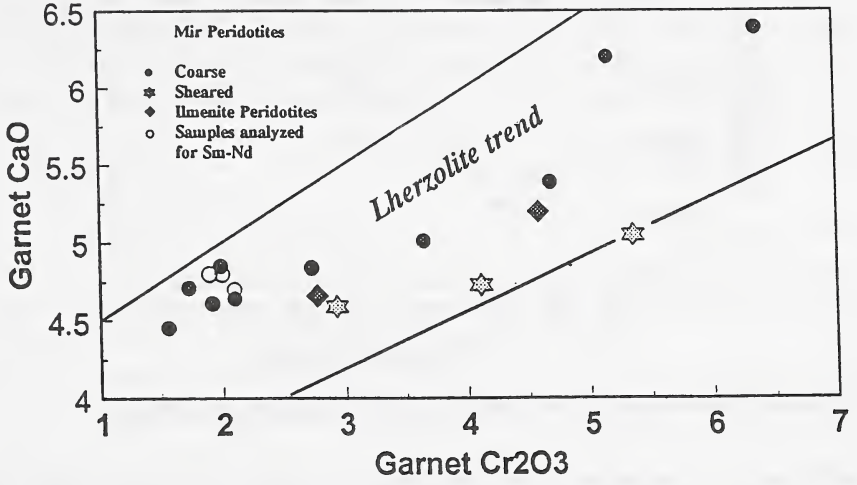


Fig. 2. Garnet compositions of peridotite xenoliths are indicative of saturation with clinopyroxene.

generally unzoned and allow some estimation of equilibration temperatures and pressures. Pyroxenes from the sheared peridotites show compositional features (relatively low Ca/(Ca+Mg) in clinopyroxene and low $Al_2O_3$ in orthopyroxene) indicative of relatively high pressures and temperatures of equilibrium. Calculations of equilibration pressures and temperatures after Finnerty and Boyd (1987) are consistent with relatively high temperatures and pressures of equilibration for the sheared peridotites(Fig. 3). Thus, the textural and mineralogic differences between sheared and coarse peridotites at the Mir pipe bear some resemblance to those between sheared and coarse peridotites in some South African occurences.

An intriguing aspect of the Mir xenoliths is the limited isotopic data reported by McCulloch (1989) and Zhuravlev et al. (1991) which indicate isotopic disequilibrium between garnet and clinopyroxene consistent with very high initial $E_{Nd}$ (22.5-24.5) at 0.7-2.0 Ga. The texture of the peridotite xenolith analyzed for Nd isotopic composition by M. McCulloch are not reported in the context of coarse and sheared peridotites. However, comparison of reported mineral compositions with our data suggest that the

three Mir samples analyzed for Sm-Nd systematics are all coarse garnet peridotites. An

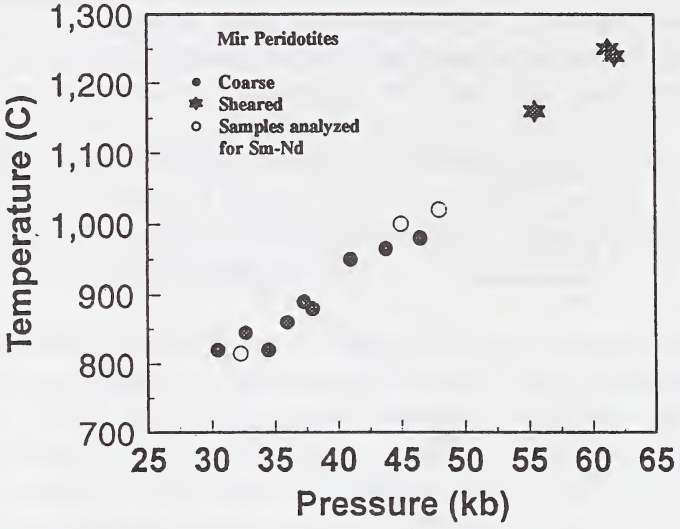


Fig. 3. Equilibration temperatures and pressures of garnet peridotites.

unresolved question is whether or not the sheared peridotites from this pipe indicate highly depleted mantle. This question is of particular regional importance given the evidence for enriched (i.e., low $E_{Nd}$) mantle beneath the nearby Udachnaya kimberlite (Boyd et al., 1993).

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