

## HARZBURGITE NODULES FROM A LAMPROPHYRE NEAR WAWA, ONTARIO, CANADA

A.J.A. Janse (Selco Mining Corporation Limited, 55 Yonge Street,  
Toronto, Ontario M5E 1J4, Canada)

### General

Composite lamprophyre dykes are exposed along highway 17 in a road cut 5 miles south of Wawa. There are three parallel dykes, two of which are approximately three feet wide and one is approximately nine feet wide. The dykes are intruded into a small stock of granodiorite and they have a vertical dip and a strike of N 240° E. The dyke rocks are rich in well preserved olivine and phlogopite phenocrysts which are embedded in a groundmass of serpentine, phlogopite and calcite, which also contains small, scattered, euhedral opaque crystals which are predominantly spinels of various composition. The widest dyke contains multiple intrusions of several varieties of lamprophyre rich in olivine phenocrysts or rich in mica. The olivine rich variety contains locally several fist-size harzburgite nodules.

### Mineralogy of the nodules

The harzburgite nodules are composed of olivine with minor amounts of orthopyroxene and chromite. There is a beginning of serpentinization in the numerous cracks which penetrate the olivine crystals and there is little development of phlogopite. The orthopyroxene is slightly more altered than the olivine. The texture of the olivine is anhedral and granular with mortar texture and undulose extinction in places along the margin of the nodules. The forsterite content of the large unstrained olivines, the mortared olivine and the undulose olivines varies from 87.7 to 89.3 percent, while the enstatite content of the orthopyroxene varies from 88.3 to 90.0 percent. Electron probe analyses on several grains indicated that there is no iron enrichment in the olivines towards the margin of the nodules. The opaques consist of magnesian chromite (No. 3 Table 1).

### Mineralogy of the lamprophyres

The olivine phenocrysts of the lamprophyre are euhedral to subhedral and they are more altered than the olivines in the nodules. Their forsterite content has a larger spread and varies from 63.0 to 80.2 percent. The phlogopites of the lamprophyre are of two types: one type consists of large poikilitic unzoned subhedral crystals, while the other type consists of euhedral zoned phenocrysts which contains amounts of up to 4% titania (No. 4 Table 1). The opaque minerals in the lamprophyre are predominantly chromium and titanium rich spinels of compositions varying between chrome spinel, titaniferous chrome-poor spinel, titaniferous chrome-rich spinel, ilmenite and titaniferous magnetite.

Concluding remarks

Because garnet has not been found in the lamprophyre and the magnesian content of the ilmenite is relatively low (approximately 3%) the lamprophyre cannot be classified as a kimberlitic rock. The lack of clinopyroxenes in the rock precludes the determination of its place on the temperature-depth curve, but the mineralogy of the nodules still indicates that the rock has a deep seated origin. The presence of harzburgite nodules in this lamprophyre indicates that the deep reaching fault and fracture system of the Kapuskasing Structure probably taps the Upper Mantle. Thus lamprophyres or other rocks containing nodules of deep seated origin may be found in other areas traversed by the Kapuskasing faults.

Table 1. Compositions of selected minerals from the Wawa dykes

Wt%	1	2	3	4	5	6	7	8
SiO <sub>2</sub>	41.81	57.96	0.74	38.17	40.30	0.46	0.25	0.46
TiO <sub>2</sub>	0.01	0.00	0.29	3.90	0.04	50.42	13.55	5.36
Al <sub>2</sub> O <sub>3</sub>	0.02	1.26	1.51	15.04	0.07	0.05	5.13	10.79
Cr <sub>2</sub> O <sub>3</sub>	0.02	0.12	64.35	0.03	0.11	0.02	2.87	33.50
FeO	6.68	4.33	20.99	7.48	12.61	41.15	70.90	38.35
MgO	50.97	35.73	10.61	20.93	46.15	2.83	5.17	10.21
CaO	0.03	0.21	0.09	0.00	0.23	0.43	0.16	0.05
MnO	0.08	0.10	0.47	0.11	0.19	2.24	0.94	0.31
Na <sub>2</sub> O	0.05	0.11	0.01	0.45	0.01	0.11	0.00	0.18
K <sub>2</sub> O	0.00	0.13	0.08	9.15	0.00	0.00	0.00	0.00
NiO	0.32	0.05	0.09	0.00	0.29	0.00	0.04	0.05
Total	99.99	100.00	99.24	95.27	100.00	97.72	99.01	99.25

Table 2. Structural formulae

	4(0)	6(0)	12(0)	24(0)	4(0)	3(0)	16(0)	12(0)
Si	1010	1946	78	5998	998	11	37	45
Ti	0	0	23	461	0	964	1607	417
Al	0	50	188	2784	1	1	954	1318
Cr	0	6	5313	0	1	0	356	2746
Fe	135	124	1832	982	263	875	9357	3327
Mg	1834	1818	1652	4900	1717	106	1213	1577
Ca	0	9	12	0	5	11	23	3
Mn	1	4	43	14	3	47	125	24
Na	3	7	0	133	0	5	0	33
K	0	6	12	1830	0	0	0	0
Ni	6	0	0	0	5	0	0	3
Total	2989	3970	9160	17102	2993	2021	13672	9493

Fo% 88

76

En% 89

Cr/Cr Al 0.96

0.27 0.67

Total iron as FeO

Probe analyses through Dr H.A.O. Meyer, Purdue University - 1: olivine from harzburgite, average of 10 analyses, calculated anhydrous, 2: orthopyroxene from harzburgite, average 6 analyses anhydrous, 3: chromite from harzburgite, 1 analyses, 4: phlogopite from lamprophyre, 1 analyses, 5: olivine from lamprophyre, average of 5 analyses, anhydrous, 6: ilmenite from lamprophyre, 1 analyses, 7: titaniferous magnetite, 1 analyses, 8: titaniferous chrome-spinel, 1 analyses.