COMPRHENSIVE INVESTIGATIONS OF CHINESE DIAMONDS.

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Diamonds from the Shengli kimberlite, near Mengyin, southeastern Shandong Province, and from the No.50 kimberlite, Fuxian group, Liaoning Province have been examined for inclusion type and chemistry, infrared spectra and cathodoluminescence characteristics. Work in progress also includes determination of $\partial^{13}C$ and $\partial^{15}N$ of selected specimens.

Inclusions:

In an earlier study (Zhang and Meyer, 1989) the initial results of inclusion chemistry were reported from a sample of approximately 10,000 diamonds (650 ct). Of the 325 diamonds with inclusions eventually selected for further examination the majority of inclusions from both localities, and hence host diamonds, belonged to the ultramafic (peridotitic) suite.

The current sampling was of a much larger population of diamonds (>20,000) and approximately 500 diamonds from Liaoning and 100 from Shandong, all with inclusions, were selected for more detailed examination. From careful visual inspection no eclogitic inclusions were identified, although it must be remembered that omphacitic pyroxene can be misidentified as olivine or enstatite. No orange (eclogitic) garnets were observed (Table 1). Analyses of some inclusions are presented in Table 2.

Infra-red Microspectroscoy and cathodoluminescence:

Shandong

99 diamonds, usually about 1mm in diameter, which were predominantly octahedral in habit, though ranging from sharp-edged specimens with smooth faces to stones with rough surfaces, broken corners, and/or rounded edges were selected which could generally be viewed through a pair of opposed octahedral faces. It was therefore possible to obtain good infrared spectra for most of them, and to take replicate spectra to see whether or not the stones were essentially homogeneous.

Nitrogen concentration varied widely, from specimens containing little enough nitrogen to be classified as Type II diamonds, to concentrations of the order of 2000 ppm. OF the 73 specimens for which replicate spectra were obtained, half (including the Type II specimens) were homogeneous, and half showed some variation in nitrogen concentration.

Almost all those diamonds which contained appreciable amounts of nitrogen also showed the hydrogen peak at 3107 cm-1, the strength being roughly proportional to the nitrogen concentration in most cases.

For those diamonds which showed appreciable variations of nitrogen concentration within the stone, the extent of defect aggregation increased with the concentration as would be expected if the whole specimen had experienced the same P/T egime after growth i.e. there was no evidence in these small diamonds for more than one stage of growth analogous to the coat and core of coated stones. However, the presence of specimens with high nitrogen content showing little aggregation, together with specimens having low nitrogen content but which show almost complete aggregation indicate that the population itself cannot be homogeneous.

In order to facilitate comparison of inclusion and infrared geothermometry, polished plates are being prepared so that spectra can be obtained in the near vicinity of inclusions which are being microprobed, and inclusion geochemistry may suggest the same result when the polished plates have been studied.

The diamonds did, however, exhibit all degrees of diminution of the platelet peak from completely unaffected to completely destroyed, not only for specimens for which IaB aggregation is virtually complete, but also for intermediate aggregation states.

Cathodoluminescence photographs indicate the presence of light radiation damage on a few specimens, but the general appearance of the group as a whole has no characteristics which would distinguish it from specimens from other kimberlites worldwide.

Liaoning

Results for the first 84 specimens examined from Liaoning appear similar in every particular, including the range of nitrogen concentrations both within and between specimens, ubiquitous presence of hydrogen, variable degradation of the platelet peak, and the existence of highly-aggregated nitrogen-poor specimens as well as unaggregated nitrogen-rich specimens. The only difference seems to be that there is even less evidence of radiation damage in cathodoluminescence.

Table 1. Visual Examination of Diamonds with Inclusions from Shandong and Liaoning Provinces, China

	Shandong		Liaoning	
	#	%	#	%
*Olivine/Enstatite	65	76	314	83
Diopside	0	0	1	(0.3)
+Garnet	6	7	4	1
Spinel	5	6	21	6
Sulfide	1	1	3	1
Olivine + Garnet	1	1	6	2
Olivine + Spinel	6	7	16	4
Olivine + Sulfide	n.a.	n.a.	12	3
Garnet + Spinel	1	1	0	0
	85	99%	377	100%

* Colorless inclusions but majority probably olivine.
\+ All purple garnets, presumably Cr-pyrope.

Table 2. Representative Analyses of Inclusions in Diamonds from Shandong and Liaoning Provinces, China.

	OL[1]	EN*	DI*	OMP*	Cr-Py[2]	Py-AR*	CHR[1]
SiO_2	40.6	57.5	56.0	56.1	41.2	39.6	0.13
TiO_2	0.00	0.00	0.00	0.00	0.06	0.30	0.31
Al_2O_3	0.05	0.56	0.57	16.3	14.3	22.0	3.73
Cr_2O_3	0.09	0.28	1.02	0.02	12.3	0.03	66.9
FeO	8.33	4.43	1.86	2.12	6.41	19.8	13.8
MgO	50.0	35.4	19.4	7.38	22.9	9.97	11.9
CaO	0.06	0.78	21.2	11.0	3.00	8.63	0.00
MnO	0.13	0.16	0.10	0.06	0.39	0.39	1.14
NiO	0.31	0.13	0.06	0.00	0.00	0.00	0.11
Na_2O	0.02	0.14	0.49	6.12	0.00	0.08	0.05
K_2O	0.00	0.00	0.22	0.00	0.00	0.00	0.00
	99.6	99.4	100.9	99.4	100.6	100.8	98.1

1. Shandong, 2. Liaoning
* Zhang and Meyer, 1989. All from Shandong.