PALAEOZOIC LITHOSPHERIC MANTLE COMPOSITION AND PROCESSES BENEATH NORTH CHINA PLATFORM

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North China Platform includes two nucleus, Ji-Lu-Liao and Ordos, which consolidated at 2.5 billion years. Early Proterozoic fold belt which consolidated at 1.7-1.8 billion years distributes at the margins of Platform and Mid-Late Proterozoic aulacogen occur between two nucleus. Three periods of kimberlitic magmatism have been recognized. They are: Mid Proterozoic kimberlitic and lamproitic activity (1649-1811Ma) represented by Yanggao field at the margin of Ordos nucleus; Palaeozoic kimberlitic activity (457-462Ma) represented by two diamondiferous kimberlites, Menyin at Ji-Lu-Liao nucleus and Fuxian at Early Proterozoic fold belt, and Late Mesozoic-Cenozoic (117-52Ma) represented by Hebi and Shexian at the Proterozoic aulacogen. The period of diamondiferous kimberlite activity conincides with a period of pronounced regional uplift in North China (eperirogeny). The features of kimberlitic fields and palaezoic lithosphere show in Tab. 1.

Research into mantle xenoliths, diamond inclusion and heary minerals from kimberlites has improved our understanding of the composition and processes of Palaezoic lithosphere, particularly in Eastern China ancient lithosphere has been destroyed by the uplifting of asthenosphere at Mesozoic and Cenozoic time (Lu et al. 1992). Thus, it can not be obtained the topography, depth and geotherm using geophysic method and heat flow measurment.

It is no doubt that ancient thick lithosphere existed before the emplacement of diamondiferous kimberlites at 457—462Ma in North China Platform. (Lu et al, 1991) In the centre of both nucleus (Mengyin, and Liulin) the lithosphere was thick (223—204km) with a marked thinen to the platfrom margins (Tieling and Yanggao). The mantle palaegeotherm intersected the diamond stability field in Mengyin and Fuxian and was lower than 40mw/m^2(1HFU). These features are as same as other cratons containning diamondifeous kimberlite in the world. Recently, some new observation and discoveries have been obtained such as, chemical characteristics of different type of peridotite, fluid inclusions in diamonds, and many native elements and alloy in kimberlites and diamonds. Those facts enable us to established some new principles to interpretate the mantle processes. Althrough eight kimberlite fields distributed at North China platform the diamondifeous pipes in Mengyin and Fuxian contain abundant mantle xenoliths and diamond inclusion. The data of this paper is predominantly based on the extensive studies from those two areas.

1. There are considerable similarities in major types of mantle xenoliths from kimberlites between North China Plaform and other places in the world. However, the peridotite with igneous and cumulate genesis may be more popular in Mengyin and Fuxian. Garnet/spinel peridotite have 30.78-52.11% SiO_2 contents in which containing $<40\%$ SiO_2 also have $>13\%$ H_2O+CO_2. Thus, the very low SiO_2 contents can account for suffering strong alteration. On the other hand, harzbergites with high SiO_2 and Gadunites with relic igneous texture might be crystallized as cumulates from ultrabasic magma at earlier evolution of the Earth (Herzberg 1993). Some peridotites with high SiO_2, low MgO, and pyroxene-rich transfering to wehrlite may also represent intrusive dike, net-vein and sheet emplaced into the base and different depth of lithosphere. Statistically, lithospheric mantle samples have 28% igneous origin beneath

Tab. 1 The features of kimberlitic and lamproitic fields and Palaeozoic lithosphere in North China Platform

	gological setting	age of magma emplaced	kimberlite geochemistry	temperature and depth of lithosphere
Mengyin, Shandong province	in the middle of Ji-Lu-Liao nucleus	457Ma	type I $\varepsilon Nd = -1.82$ $(^{87}Sr/^{86}Sr)i = 0.70418 - 0.70428$ high Sr, Th, Nb, Ta, MgO/SiO_2 moderade REE, Ti low Ba	223km 1184℃
Fuxian, Liaoning province	at the margin of Proterozoic fold belt and near the boundary between Ji-Lu-Liao nucleus	462Ma	transition between type I and II $\varepsilon Nd = -1.11$ $(^{87}Sr/^{86}Sr)i = 0.70736$ high REE, Rb, Ba, Nb, Ta, moderate Ti	208km 1123℃
Tieling, Liaoning province	at the margin of Ji-Lu-Liao mucleus	701Ma ?	highest REE high P low Nb, Ta, Ti	<150km
Huanren, Liaoning Province	at the margin of Ji-Lu-Liao nucleus			
Yanggao, Shanxi province	at the margin of Oreos nucleus	1649—1811Ma	type I high Ti moderate REE, P, Ba low Nb	138km 1148—1161℃
Liulin, Shanxi province	in the middle of Ordos nucleus		moderate P low Ti, MgO/SiO_2	204km 1161℃
Hebi, Henan province	at the Proterozoic aulacogen	117—52Ma	Low REE, Nb, Ta, Ba, Rb, P lowest Ti	<130km
Shexian, Hebei Provice	at the Proterozoic aulacogen		similar to Hebi kimberlite	116—113km 818—1011℃

Mengyin and Fuxian except Marid suite and wehrlite-pyroxenite suite.

2. All peridotites have steep slopes LREE-rich pattern. They contain 8 times more La than those from south African (Nixon 1981). At least 6 samples not only have sheared texture but also have LREE-rich pattern. La contents are from 260 (the highest one in peridotitic xenoliths) to 60 times of chondrite indicating that those rocks may also be sampled from lithosphere but asthenosphere. It is better to explain that lithospheric shear zone developed beneath Fuxian and Mengyin. The coupling deformation with metasomatism shows that deformation in lithospheric mantle is not a simple isochemical mechanical process but is often asscciated with compositional change related to the additional influx of fluid or melt from asthenosphere (Downes 1990) and more deep seat.

3. Two kinds of fluid acted in ancient lithosphere beneath Mengyin and Fuxian have been assumed. One fluid which was related to kimberlitic or other alkalic melt is the main type and widely affected in ancient lithosphere as mang investigators have emphasized already. Another fluid might be from deep mantle which is substantially supported by the discovery of native elements, carbite, silicite and oxidate in kimberlites, such as Cu, Ag, Pb, Zn Fe, Si, $FeSi_2$, (FeTi) Si, WC SiC and FeO (Zhao, Lu, et al 1993) and native elements, alloy (Zhao, Lu, et al, 1995) chloride, sulphide (Miao, Liu, et al 1991) such as Ag, AuFe, KCl, NaCl, FeS_2 PbS. The native elements can certainly not crystallize in kimberlitic magma and lithosphere for the high fo_2 condition. These minerals montioned above can provide a windows into deep mantle. In addition, fluid indusions have been recognized in 12 diamonds in Fuxian (Zheng, Lu, et al. 1994) and CO_2, N_2, H_2S, CH_3, H_2O, SO_2, NH_3, H_2, HS^{-1} and Cl^- have been identified. Based on above data, the main composition of second fluids inferencelly are C. H. O. N. S and alkali metals and the C-H-O fluid speices varied from deep mantle to lithosphere with the fo_2 increasing. It can penetrate kimberlite magma and mixed with the first fluid to enhance the capability of metasomatism. A mantle plume might occur and several secondary order wet plum raising to induce the melting event and along the conduit of kimberlitic magma continuously.

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