HALITE MICROGRAINS WITH CARBON-BEARING GRAINS OF THE CONGO DIAMOND BY IN-SITU SEM ANALYSES

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Introduction: Large diamond crystal is considered to be formed under high pressure condition with xenoliths grains of Fe, Mg, Si-rich grains from deep mantle sources. However, micro-xenoliths of halite from shallow origin are recently found in the Congo diamond by author, which is main purpose in this paper to elucidate the in-situ SEM analyses.

Samples used in this study: We collected several large pieces of the Congo diamonds in Africa, which show round and irregular shapes. To compare with the present results, we use Kimberlite diamond in South Africa, which shows clear shapes of crystal planes.

In-situ analyses of Kimberlite diamond: In-situ analyses by the FE-SEM show that diamond from kimberlite in South Africa has foreign xenoliths grains of Fe, Mg-rich silicates and Ca, Fe and Mg carbonates (without any Na and Cl) . It is considered to be previous understanding that Kimberlite diamonds are considered to be direct remnants of deep mantle sources with Fe and Mg-rich micro-grains, though there are Ca contents.

Congo diamond with halite crystals: From in-situ observation and analysis of the Congo diamond, it contains nano-particles of carbonates (including calcite) and gypsum, together with halite of clear crystal plane and grains of Fe-silicates (without Mg) covered wholly by irregular carbon-bearing grains.

Formation processes of Congo diamonds: The present results indicate the following formation process with two steps:

1) First Congo diamond is considered to be formed at deeper place by high pressure condition.

2) During up-lift process from deeper place, its crystalline surface is broken at shallow depth by dynamic high-pressure. The second process is found by a) its surfaces are rounded and irregular blocks, b) remained nano-particles of carbonates (including calcite) and gypsum are found with Ca, C and S elements, and c) clear halite crystal plane in cavity and grains of Fe-silicates (without Mg) on surface are found and covered by irregular carbon-bearing micro-grains based on shallow explosion process at

the crust depth (probably by explosions with underground water around impact crater site and/or with salty liquid condition of sea-water impact on shallow carbonates at old sites of African continents).

Summary: The present study is summarized as follows:

1) From in-situ FE-ASEM observation and analysis, samples of the Congo diamonds contain nano-particles of carbonates with halite crystals, which cannot be found in the Kimberlite diamond from South Africa.

2) The Congo diamond is considered to be broken during up-lift process at shallow places with salty liquid condition, probably accelerated by impact process on the surface if it is remained.

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