

**EXPECTED STORAGES OF NANO-DIAMONDS AND/OR DIAMONDS IN THE LUNAR ROCKS.**

Yas. Miura, Yamaguchi University, 1677-1 Yoshida, Yamaguchi University, 753-8512, Japan (yasmiura@yamaguchi-u.ac.jp)

**Introduction:** Diamonds with large size formed at deeper mantle are main characteristics of the active water-planet Earth due to main sources of carbon from life-materials on the dynamic surface and circulated plate-tectonics and mantle convection, though there is still problem to explain to move down and up by light element carbon. Main carbon storage on the Moon without ocean and air is mainly in the brecciated or metamorphosed rocks [1]. The main purpose of the paper is to discuss source of diamonds with nano- and large sizes probably found in the lunar breccias [1, 2].

**Diamonds formed at deeper Mantle of the Earth:**

Large diamonds (more than mm in size) are formed in deeper Earth of the mantle based on the pressure and large crystal size, though there are remained questions

1) how to transport many carbon elements to deeper mantle (without Ca element so much), and

2) how to keep large diamond crystal shape from deeper Mantle to shallow crust (around hard continental rocks). These questions are to be explained mainly by active planet of the Earth of plate tectonics, mantle convection and cracks with the continental drift. In fact, recent result of diamond from R.D. Congo indicates metamorphosed crystal with inclusions of shallow sources of calcite carbonates and halite crystals [5], as listed in Table 1.

**Nano-diamonds formed at shallow crust of the Earth:** Nano-diamonds (as in nm scale) formed by rapid transformation of dynamic reaction can be obtained by Raman spectra pattern [6] between graphite and normal diamond. Quenched process of nano-diamond formation can be found at meteoritic impacts (in air and ground), earthquake explosions (*i.e.* underground explosions similar with volcanic event of shock wave), and artificial explosions. This suggests that nano-diamond carbon is expected to find also at lunar rocks also, as listed in Table 1.

Table 1. Diamonds and nano-diamonds on the Earth.

- 1) *Diamond with large size (more than mm scale):*  
Deep mantle-source rocks (with stable growth)
- 2) *Nano-diamond with smaller size (in nm scale):*  
Quenched formation (at surface & deeper places).

**Expected diamond crystal in the lunar rocks:**

If carbon-bearing materials (such as carbon dioxides) are stored in deeper Moon during giant impact event with air-planets of primordial Earth, these carbon-

bearing materials are main sources of diamond carbon of the lunar mantle. Evidences of such deeper carbon are found by increased carbon content of lunar brecciated rocks [1, 2, 3, 4], and deeper sources of terrestrial diamonds which has big event of giant impact [3, 4], as shown in Table 2. The problem is the way how to move up from the interior on silent Moon body. The only way to go surface is larger impact event to the Moon. This suggests that smaller diamond crystal will be found at rim of impact craters, some boundary of the highland and lunar Mare, or deeper cliffs on the Moon in future explorations.

**Expected nano-diamonds in the lunar rocks:** As nano-diamonds formed by shock-wave process with quenched reaction can be found at lunar surfaces of meteoritic impacts, and deeper interiors of moonquake explosions (*i.e.* underground explosions similar with surface quake) [2]. This suggests that nano-diamond is expected to find by in-situ raman spectra and electron microscopic data, as shown in Table 2. Nano-diamond will be found at all event places on the Moon in future explorations.

Table 2. Expected materials of nano-diamond and smaller diamond in the Moon

- 1) *Nano-diamond:*  
Lunar breccias (surface and deeper interiors)
- 2) *Smaller diamond:*  
From Deeper interior to shallow highland.  
(at crater rim, boundary of Mare and Highland).

**Summary:** The present results are summarized as follows.

- 1) Smaller diamond crystal is expected to find in the lunar rocks derived from the lunar interior with impact events.
- 2) Nano-diamonds will be found at lunar brecciated Rocks.

**References:**

- [1] Heiken G., Vaniman D. & French B. (1991): *Lunar source book* (Cambridge Univ.Press). 468-474.
- [2] Miura Y. (2010): LEAG2010 (submitted).
- [3] Miura Y. (2009). LPI Contrib. No. 1515 (LEAG 2009), 2042, 2043.
- [4] Miura Y. (2010): *LPS XL*, Abstracts #2462, #2489.
- [5] Miura Y. (2010): (submitted)
- [6] Nemanich R.J. et al. (1988): *J. Vac. Sci. Technol.* (American Vacuum Society), A6(3), 1783-1787.