PLANETARY CASES OF SEPARATED CARBON GRAINS TO PRODUCE NANO-TO MACRO-DIAMONDS.
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Introduction: Carbon grains in the solid rock are generally difficult to be formed by stable solid-solid reaction because carbon sources are unknown in solid rocks except carbon-bearing compounds [1, 2]. The purpose of present paper propose planetary case of separated carbon grains to produce nano-, micro- to macro-diamond carbon.

Planetary formations of carbon and diamonds: There are five cases of carbon separation and formations of nano-, micro- and macro-diamonds as follows (Fig. 1) [1, 2]:

1) There are three cases formed by meteorite (chondrite) and impacted solid surfaces of asteroids, the Moon and Mercury (designated as type-C1), Mars and Venus (type-C2) and Earth (type-C5).

2) One case is formed by meteorite and planetary air (type-C3), and other case is with Earth's ocean water (type-C4), as shown in Fig.1.

3) Recent data of deep interior sources of macro-diamond of water-planet Earth are included in type-C5 carbon (diamond), because there are no evidences from deep interior of light carbon sources. This is mainly because in-situ observation on the surface of the macro-diamonds with high-pressure of mineral and rock textures. However, it can be formed on the primordial surface of basic rocks if high-pressure condition might be generated mainly by meteoritic collisions etc. [1, 2].

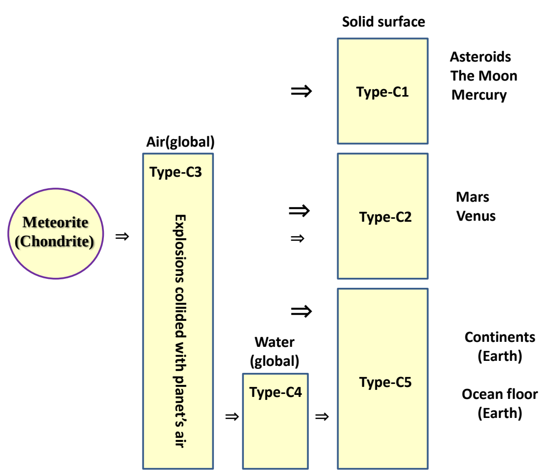

Fig. 1. Schematic diagram of five cases to form separated carbon and various diamonds on various planetary surfaces when meteorite (chondrites etc.) are collided generally [1].

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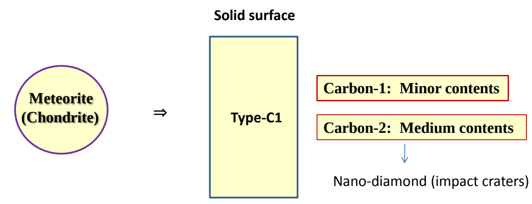

Fig. 2. Schematic diagram of airless planetary formation (Type-C1) which carbons are separated (carbon-1) and formed nano-diamonds (carbon-2) [1].

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Airless planetary formation (Type-C1): Primordial case of carbon is found in airless celestial bodies of asteroids, the Moon and Mercury, where carbons are separated (called as carbon-1with minor content) and formed nano-diamonds (called as carbon-2 with medium content) , as shown in Fig.2.

Air planetary formation (Type-C2, 3): Primordial air of carbon dioxides of Mars and Venus can be formed carbon-rich grains by collided asteroids (Type-C3) which might be found as various carbon-contents (from carbon-1 to -3) and from nano- to micro-diamonds of the highest contents of carbon-3, as shown in Fig. 3.

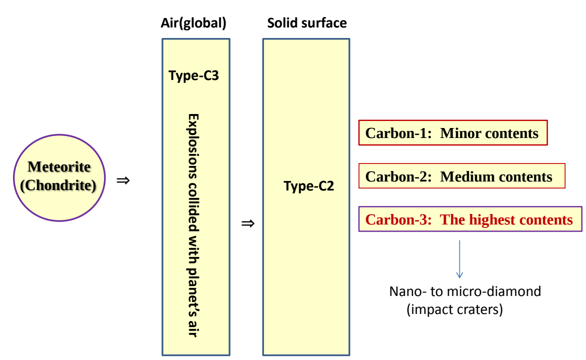

Fig. 3. Schematic diagram of air planetary formation (Type-C2, 3) which carbons are separated (carbon-1) and formed nano- to micro-diamonds (carbon-2, 3) [1].

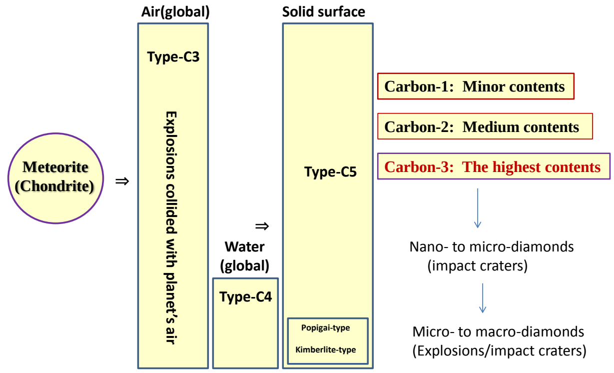

Fig. 4. Schematic diagram of air and water planetary formation (Type-C3 to 5) which carbons are separated (carbon-1) and formed nano- to micro-diamonds (carbon-2, 3) until macro-diamond by multiple processes [1, 2].

Air and water planetary formation (Type-C3 to 5): Carbonless air of planet Earth can be concentrated to be formed carbon-rich grains by collided asteroids (Type-C3 in air and type-C4 in global ocean water) which might be found as various carbon-contents (from carbon-1 to -3) and from nano- to micro-diamonds of the highest contents of carbon-3, as shown in Fig. 4 [1, 2].

Complicated formation (Type-C5): Complicated formation of diamond carbon can be found at soften surface with air molecules and water fluids with soil-rich sea-floor of planet Earth which shows major two-types of macro-diamonds on planet Earth as follows (*cf.*Fig.4) [3-7]:

1) The Kimberlite-type diamond with basic rocks and macro-diamond [5, 6] can be generated by shock-wave explosions with high-pressure and temperature at shallow interior of older continental rocks mixed with plate tectonic process with fluids-transportation also.

. 2) The Popigai-type diamond with impact nano- to micro-diamonds [7] can be generated during huge impact-vapor plume of large impact crater process from carbon-separated grains previously formed by air explosion [1, 2] before impact on ground.

Application of macro-diamond formations: The present model suggests that macro-diamond carbon requires complicated situations of nucleation growth process from original separated nano-carbon grains. Therefore interior explosions of the Kimberlite-type diamond can be found only water planet Earth, whereas the Popigai-type micro-diamond with air and surface explosions by impact processes might be found at other air-planets of Mars and Venus. However, all nano-diamond carbon can be found at any celestial surfaces when there are any celestial collisions in the cosmic space [1, 2].

Summary: The present study is summarized as follows:

1) Major five cases of carbon separation and formations are classified to be formed nano- and micro-diamonds by meteorite (chondrite) and impacted solid surfaces of any celestial bodies, whereas macro-diamonds are formed by complicated process between the meteorite and planetary Earth with the air and ocean water systems.

2) The present model suggests that macro-diamond carbon requires complicated situations from original separated nano-carbon grains. An interior explosion of the Kimberlite-type diamond can be found on water planet Earth.

3) The Popigai-type micro-diamond with air and surface explosions by impact processes would be found at other air-planets of Mars and Venus.

4) Almost all nano-diamond carbon can be found at any celestial surfaces by any celestial collisions in the cosmic space.

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