CARBON-BEARING MATERIALS OF THE ANTARCTIC METEORITES FROM THE ASTEROIDS AND THE MOON. Yasunori Miura. Yamaguchi University, Yamaguchi, Yamaguchi 753-0074, Japan. yasmiura50@gmail.com

**Introduction:** Carbon-bearing sources of the collected meteorites to be determined the terrestrial ages are clearly unknown the detailed information of carbon changes after passing the terrestrial atmosphere with meteorite melting with remained the fusion crust [1, 2]. The best method to determine the terrestrial ages with the accelerator mass analyzer is to use meteorite interior which is covered by the fusion crusts of quenched solids during the atmosphere passing. Antarctic meteorites have significant information on carbon-bearing materials [1, 2]. The purpose of the present paper is to elucidate the detailed carbon-bearing materials and textures obtained in the remained meteorite grains from Asteroids, compared with the Antarctic meteorite from the Moon.

**Carbon-bearing textures by meteoritic shock wave:** The conventional methods of crystalline carbon-bearing materials (cf. diamond, carbides and carbonates) are formed slowly from vapor-liquid conditions with higher temperature and pressure, to solid conditions which can be obtained macroscopic crystalline grains checked by optical and X-ray diffraction methods (Fig.1).

On the other hand, the present study on carbon-bearing materials are formed by quenched process to obtain microscopic solid aggregates of crystalline to amorphous materials, and voids-rich texture with inclusions based on phase-state changes of vapor, liquid and solid (VLS) as shown in Fig.1 [3, 4].

Any “meteorites” formed by rapid cooling processes contain the microscopic quenched aggregates of crystalline to non-crystalline grains, and voids-rich textures after solidification (Fig.1).

Fig.1. Schematic diagrams of the conventional and present methods to form macroscopic and microscopic solids by phase changes of vapor, liquid and solid (VLS) [3].

Antarctic meteorite Yamato 86032 (lunar meteorite): Lunar meteorite (Yamato 86032) reveals carbon-bearing materials of irregular shapes and various sizes on the selected grains by the in-situ observation with the FE-SEM (EPMA) as shown in Fig.2. The present result suggests that lunar material includes volatile elements of carbon which are formed by various impact-related processes as significant evidences of carbon changed process on the Moon.

![Fig.2. Electron micrograph of the sample Yamato 86032 (lunar meteorite) on the Ca-plagioclase composition with significant carbon contents [5].](image)

Antarctic meteorite Yamato 75029 chondrite: Chondritic meteorite (Yamato 75029) reveals carbon-bearing materials attached to mafic silicates and Fe-Ni metallic grains of irregular shapes and various sizes with the FE-SEM as shown in Fig. 3. The present result suggests that chondrite H3 includes minor carbon contents in major minerals during formations by various impact-related processes.

Antarctic meteorite Yamato 74191 chondrite: Chondritic meteorite (Yamato reveals carbon-bearing materials attached to mafic silicates and Fe-Ni grains of irregular shapes and various sizes with the FE-SEM as shown in Fig. 4. The present result suggests that chondrite L3 includes significant amount of carbon in major minerals during formations by various impact-related processes.
Formation of carbon-bearing materials: After supernova explosion of the star with carbon formation, carbon-bearing materials are rapidly formed at any celestial bodies from dusts to planets at extraterrestrial spaces, which are observed at the meteoritic interior of asteroids and impacts with planet Earth, as shown in Fig.5. Terrestrial carbon-bearing sites are ranged from deep to shallow sources in dynamic planet Earth (Fig.5). The present result can be explained also that carbon-separated grains by meteoritic impact sites can be new carbon source of impact sites (without any crater or disappeared meteorite body) [3-5], which are interpreted by "carbon changed process" on extraterrestrial materials.

Extraterrestrial carbon-bearing materials (ETC):
Carbon original site ET-1: Star interior to space by supernova (Major origin)
Concentration site ET-2: Celestial bodies (Dusts, meteorites, planets and satellites)
Concentration site ET-3: Meteoritic shower (Expansion in air, without crater and meteorite fragments) [In this study]

Terrestrial carbon-bearing materials (TC):
Concentration site T-1: Surface (Shallow origin)
Concentration site T-2: Interior (Deep or multiple shock-wave processes)

Fig.5. Outline of formations of carbon-bearing materials at extraterrestrial and terrestrial sites [3-5].

Summary: The present study is summarizes as follows [5]:
1) Antarctic meteorites of Yamato 86032, 75029 and 74191 contains various shapes, contents and sizes of carbon-bearing materials and textures.
2) Carbon sources of the terrestrial age dating can be proved as various existences with the major and minor mineral grains.
3) Carbon can be remained widely at the rapid quenched process with other grains, where the texture is indicator at individual rapid quenched reaction to form microscopic grain-size and the texture.
4) Carbon-bearing materials on the meteorites are formed at asteroids interior and meteoritic explosions between extraterrestrial and terrestrial locations.
5) The present result can be explained new sources of carbon-bearing materials at impact sites (even without any crater or meteorite body), which are interpreted by "carbon changed process" on extraterrestrial materials (including the Asteroids and the Moon).

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