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Bulk and in-situ carbon-bearing samples of global terrestrial rocks and minerals

Y. Miura
Yamaguchi, Japan (yasmiura@yamaguchi-u.ac.jp, 81839240723)

Introduction: Previous study of carbon-contents on macro-minerals is not discussed well due to stable crystallization at higher temperature without any gas state [1]. However, recent study suggests that carbon elements with three material states are strong indicator to analyse global reaction, because carbon forms various compounds even in various conditions of high temperature-pressure at dynamic process on active planet Earth of global air-liquid-solid system states [2].
Carbon-bearing terrestrial rocks and micro-mineral grains: In order to confirm carbon cyclic process on the terrestrial interior with various formation conditions, bulk carbon contents of 1,013 terrestrial rocks has been obtained on volcanic (169 samples), igneous (135 samples), normal sedimentary rocks (146 samples) with limestone (563 samples) as follows:
1) The highest bulk-carbon contents which are found at rhyolite (in andesite and basalt volcanic samples), serpentine-komatiite (in igneous samples of granite, diorite, gabbro and peridotite) and coal-limestone (in sedimentary samples of sandstone, chert, shale, fossil, coral and shell), are obtained at relatively quenched samples to be remained carbon-bearing phases.
2) Carbon-bearing micro-mineral grains of 9 samples in composition are obtained at volcanic plagioclase (Mt. Miyake, Japan), Chinese Huanghoite (with REE), Canadian oceanic basalt and Japanese Island basalt (Hagi-Mishima Island, Yamaguchi), and two diamonds (shallow Congo and deep Kimberlite), which include 29 typical micro-grains with and without carbon compared with terrestrial and artificial micro-grained obtained by the FE-ASEM observation [2, 3].
Carbon-bearing structural and textural states: Carbon is included in the following three states of carbon-bearing phases [2-4]:
1) In crystalline mineral: Samples formed at quenched or slow-cooling from carbon-bearing state on high temperature are often to be included during crystallization of minerals.
2) In irregular nano-grains on mineral surface: New types of irregular-shaped nano-grains with carbon are formed by quenched conditions of volcanic, earthquake and meteoritic impact events.
3) In regular-shaped grains: New types of regular-shaped nano-grains are formed under water-bearing hydro-conditions during solid-formation.
Carbon-bearing samples as impact and volatile indicators: Lunar Apollo samples show
relatively higher bulk-carbon contents in the impacted soils and breccias [4-6], which can be obtained in similar terrestrial quenched samples in complicated formation for water-rich Earth.
Summary: Bulk-carbon contents are obtained in relatively quenched samples of various terrestrial and lunar samples. Micro-grains of a few carbon-bearing textures are obtained in detailed electron scanning electron-microscopic works.
References: [1] Ernst W.G. (1990): The Dynamic Earth (Col. Univ. Press), 280pp. [2] Miura Y. (2007): Frontiers in Mineral Sciences 2007 (Univ. of Cambridge UK), 223. [3] Miura Y. (2007): LPI Contrib.No.1338 (ISBN No.1540-7845, USA) 1277.pp 2. [4] Y. Miura (2010): LEAG-2010 (LPI) 3005. [5] Miura Y. (2012): Japan Geophy.Union-2012 (Chiba-Makuhari, Japan), 1790. [6] Miura Y. (2012): Carbon-fixing method (JPA-PAO No. 2009-160562).