

Carbon-bearing materials formed by state-change: Earth, Moon and Meteorites

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Introduction:

The volatile element performs stably three macro-state-changes in the water-planet Earth and life continuously. However, reaction at extreme conditions is difficult to be observed generally.

Present study proposes solidified model from fluid-state during extreme conditions on water-planet Earth and extraterrestrial celestial bodies.

Carbon contents of various Earth's rocks:

Representative rocks of global Earth's rocks (mainly from the Japan) selected to igneous rocks (plutonic and volcanic) have been analyzed carbon contents by the XRF instruments., where rocks are selected finally for significant carbon contents. The result shows that higher carbon contents are obtained at volcanic rocks (quenched) than plutonic rocks (slow cooled), and blackish colored rocks (mafic) than whitish feldspar-rich (felsic) rocks. It's obtained in this study that carbon contents are richer in colored mineral contents.

Carbon contents of lunar rocks:

The lunar samples are used reported data of the Apollo (U.S.A.) rocks and lunar meteorites. It has been explained that significant carbon contents of the brecciated rocks are caused by extra-lunar meteorites with higher carbon contents. In this study, however, lunar brecciated rocks have higher carbon contents (not by mineral kinds) than basalts less brecciated relatively. This shows in this study that lunar breccias formed rapid cooled by impacts contain much carbon contents on the Moon.

Carbon contents of meteorites and fluid-solidification:

It's reported previously that carbonaceous chondrites contain much higher carbon and water contents than ordinary chondrites. Present model explains that volatile molecules (water and carbon dioxides) of chondrites, however, have produced at extreme condition by collisions, followed material changes from fluids to solidified groundmass texture to combine with chondrule grains formed primordial carbonaceous materials finally. Fluid-state cannot be observed to be solidified quickly during shocked impact reaction, which is mixed with chondrules and crystalline grains to be formed fluid-solidified texture of chondrite meteorite.

Laser experiment for fluid-solidification:

Author has performed a laser sputter experiment on a target rock, to produce the rock texture with fluid-solidified micro-grains, which indicates that fluid-liquid phase is quenched to be solidified grains after laser irradiation. It's obtained in this study that carbon-bearing molecules are remained as solidified grains after quenched shocked impact process.

Shocked formation of carbon-bearing materials on Earth, Moon and Asteroids:

Carbon-bearing materials have been remained by fluid-to-solidified process at extreme condition of meteoritic collisions (on Earth, Moon and Asteroids). On the Earth, shocked reactions by earthquake and volcano produce carbon separation from carbon-rich rocks.

In this sense, huge amounts of global air and water of planet Earth are required to be formed by huge planetary collisions.

Summary:

Carbon-bearing solids remained at extreme condition are explained by fluid-solidified process on primordial Earth, the Moon and Asteroids, which has been confirmed in this study by sample analysis, carbon reported data, TEM observation and laser shocked experiments. The present results indicates that impact generation of carbon and fluid molecules (of carbon etc.) is obtained newly

on the Earth and the celestial bodies.

Keywords: State-change, Carbon bearing-materials, Earth, Moon and Meteorites