

Nano-Minerals Formed by State-Changes: Carbon-, Rare-Earth REE- and Chlorine-Bearing Materials

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On our Earth and the Solar System bodies, nano-minerals are formed as remnants of three state-changes as follows:

1)Nano-minerals are remained at normal (room) P-T conditions among three state-changes from air, ocean liquid and solid rock systems.

2)New definition of mineral is generally solid phase in room P-T (from macro to micro-nano phases) by state-changes widely in gas-liquid-solid states.

3)Carbon-bearing nano-phases are formed at shock-wave rapid VLS conditions due to stable at high P-T conditions, which are applied for fixing high temperature carbon dioxides gas (Miura, 2007; JPO patents). Carbon-bearing solids formed at shock wave condition of volcanism(phlogopite in Shimonoseki, and crystals in Hamada and Hagi Cities; Undergrad. Thesis, Yamaguchi University, 2009).

4)Apollo lunar plagioclases with different structure and chemical compositions are explained with carbon, and REE (Eu) with Ca during impact shock-wave reactions (Miura, 2009). Impact breccias contains with high Rare-Earth REE elements and obtained at the impact breccias of the Sudbury craters (Lunar Resources NASA Rep.; Miura , 2011).

5)Chlorine-bearing nano-minerals with iron during shock-wave reactions are obtained as akaganeite in the Apollo lunar samples and artificially (Undergrad. Thesis, Yamaguchi University, 2009).

6)Nano-minerals can be formed not only water-planet Earth, but also water-less extraterrestrial Solar System due to quick and short formation of state-changes.

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