WATER AND CHLORINE INDICATOR ON THE MOON WITH AKAGANEITE-LIKE COMPOSITION.

Y.Miura, Division of Earth Sciences, Graduate School of Science and Engineering, Yamaguchi University,Yoshida, Yamaguchi, 753-8512, Japan. yasmiura@yamaguchi-u.ac.jp.

Introduction: Water molecule on dry lunar surface is detected by infrared-spectra detected, though there is few terrestrial ocean water [1, 2, 3] with chlorine, metal, and light elements [2]. Purpose of the present paper is to elucidate water and chlorine reserved in materials.

Various water molecules: Two types of water molecules (liquid H_2O and crystalline OH) are considered to be different with sources and formation processes. Formation of "liquid water molecule" (H_2O) is vaporized molecules formed by meteoritic impacts to produce liquid (ocean) water by cooling process on the primordial Earth planet, though airless Moon has few liquid water molecule from lunar surface [2].

On the other hand, "crystalline water molecule" (OH) located to atomic positions which is formed at higher temperature and pressure conditions, can be formed easily by dynamic reaction of bombardments or so, though airless Moon is usually difficult to maintain such crystalline molecule (OH) on the lunar surface [2].

Therefore, crystalline water molecule (OH) is considered to be found on the Moon, especially on impact craters of the Polar Regions.

Water with chlorine as akaganeite on the Apollo lunar rocks: Micro-rosettes (flake) texture with meteoritic iron metals (Fe, Ni, Co) and crystalline water molecule (OH) with chlorine (Cl) as akaganeite (β-FeOOH) has been reported as "rusty rock" 66095of Apollo 16 [3], mainly by impact-produced aggregates by meteoritic elements to show sporadic distribution of the micro-texture with chlorine [3].

Micro-rosettes texture with chlorine of fallen fragments of meteorites on the Earth: Four meteorites of the Nio, Kuga, and Mihonoseki (in Japan) [4, 5, 6, 7] show similar micro-flake ("rosettes") texture with Fe, Ni, Co, Cl and O (in Akaganeite composition) mainly on "the melted fusion crusts and spherules formed in air of the Earth" [8] by the FE-ASEM (Field- Emission Analytical Scanning Electron Microcopy) analyses taken by author as follows:

1)The Nio chondritic meteorite: Meteoritic spherules and fragments formed at explosion in atmosphere by the Nio meteoritic shower found at the fallen sites of Niho, Yamaguchi, Japan reveal sporadic distribution of many micro-rosettes texture with chlorine, as shown in Fig.1.

2) The Kuga iron meteorite: The Kuga iron meteorite found in Kuga, Iwakuni, Yamaguchi, Japan has "fusion-crust" which includes Fe-Ni-Cl-bearing micro-rosettes texture formed from meteorite melting in atmosphere [8].

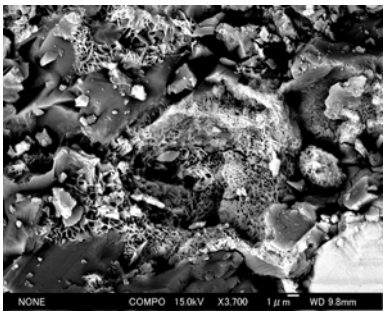

Fig.1. FE-SEM micrograph of Fe-Ni-Cl-O-rich flake texture with sporadic distribution of the Nio chondrite fallen in Yamaguchi, Japan.

3) The Mihonoseki chondritic meteorite: The Mihonoseki chondritic meteorite has been found after passing through wooden house in Mihonoseki, Shimane, Japan. Sporadic distribution of rosettes texture with 1μm in size can be found in spherules and fragments [8] of this sample.

Water and chlorine exploration on the Moon: The impact minerals of Akaganeite composition with Fe,Ni, Co, Cl and OH are considered to be found all lunar surfaces around impact craters, where Cl and OH ions are main ions for ocean-sea water composition (on the Earth).

Summary: The present study is summarized as follows: 1) Four meteorites of the Nio, Kuga, Mihonoseki and Carancas show micro-rosettes textures with Fe, Ni, Co and Cl-bearing elements with crystalline water phase as akaganeite-like composirtion. 2) The present comparative study suggests that lunar surfaces have crystalline hydroxyl (OH) and chlorine ions around impact craters or impact fragments.

Acknowledgements: Author thanks to Drs. T. Kato, T. Tanosaki, H. del Prado for discussion.

References: [1] Miura Y. (1992) Proc. Missions, Technologies and Design of Planetary Mobile Vehicles (Toulouse, CNES), 1, pp.115-124. [2] Miura Y. (1994) Secondary Ion Mass Spectrometry IX (John Wiley & Sons), 9, pp.290-293. [3] Frondel J.W. (1975) Lunar Mineralogy (John Wiley & Sons) ,pp.84-87. [4] Miura Y. (2008) LPI-Publication # 2027. [5] Miura Y.(2008) 5th AOGS Annual Meet. (Busan), CD#PS07- ST31-A22. [6] Y. Miura (2008) ISTS Issue of Japan Society for Aeronautical and Space Science (JSASS),#2008-0-46.pp.2. [7] Y. Miura (2008) Meteoritics & Planetary Science, 43-7, #5189. [8] Miura Y., Kato T. (1993) American Institute of Physics (AIP) Conf. Proc., 283 (Earth and Space Science Information Systems), (1993), pp. 488-492.