

The Contamination Control for Astromaterial Samples in Extraterrestrial Sample Curation Center of JAXA.

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Introduction: The Extraterrestrial Sample Curation Center (ESCuC) received the Hayabusa returned sample [1], and then, we performed the curatorial works, such as initial description, sample allocation and sample storage, for the returned samples at ESCuC [2].

Contamination control of astromaterial samples is essential technique, and it is important to handle and storage of samples without terrestrial contamination and alteration as possible [3]. Therefore we evaluated cleanliness of the sample storage environments such as clean rooms and clean chamber. In addition, we evaluated of the cleanliness of the quartz glass that touched the sample directly.

Evaluation for Cleanliness of Clean Chamber, Clean Rooms and Quartz Glasses: Silicon witness wafers were exposed to sampling locations (Clean Chamber No. 2 and Planetary Sample Handling Room (class 100 – 1000) in ESCuC to evaluate organic and metallic contaminations. The wafers were analyzed by TD-GC-MS (Thermal Desorption-Gas Chromatography-Mass Spectrometry)[4] and VPD-ICP-MS (Vapor Phase Decomposition Inductively Coupled Plasma Mass Spectrometry) [5].

For quartz glasses, a multi-stage ultrasonic cleaning by organic solvents and the ultrapure water, and acid-alkali liquids cleaning have been performed. The cleanliness of washed quartz glass plates were also evaluated by TD-GC-MS and VPD-ICP-MS.

Organics: Organics on the wafers and the washed glass plates were evaluated by TD-GC-MS. Total amount of the organic carbon on the wafers were less than $0.04 \times 10^{-9} \text{ g/cm}^2$, and the washed glass plates were less than $0.5 \times 10^{-9} \text{ g/cm}^2$.

Metals: Concentrations of 32 kind of metal contaminant (B, Na, Mg, Al, K, Ca, Ti, Cr, Mn, Fe, Ni, Co, Cu, Zn, Ga, Sr, Y, Zr, Mo, Pd, Ag, Cd, In, Sn, Ba, La, Hf, Ta, W, Pt, Au and Pb) on the wafers and plates were evaluated by VPD-ICP-MS. These elemental concentrations on the wafers were within the range of $0.01 \sim 100 \times 10^9 \text{ atom/cm}^2$, and the washed glass plates were $1 \sim 1000 \times 10^9 \text{ atom/cm}^2$ or less than detection limits. The concentrations of aluminum and iron on the wafers were high ($\sim 100 \times 10^9 \text{ atom/cm}^2$). These elements on the washed glass plates were also high ($\sim 1000 \times 10^9 \text{ atom/cm}^2$). Because it is included a lot in a material constituting the clean chamber and the clean rooms, the concentration of these elements is high.

References: [1] Abe et al. (2011) *LPS* **42**, #1638. [2] Yada et al. (2012) *MAPS* **49**, 135. [3] Karouji et al. (2014) 2nd Symposium of Solar System Materials, P08. [4] Taira et al. (2009) *Clean-technology* **4**, 45. [5] S.H. Tan (1995) *NIMB* **99**, 458-461.