

## Ground-based simulation of Enceladus fly-through plume sampling and analysis using ultra-low density aerogel

\*藤島 皓介<sup>1</sup>、高萩 航<sup>2,4</sup>、瀬尾 海渡<sup>4</sup>、齋藤 宏貴<sup>4</sup>、本郷 やよい<sup>1</sup>、田端 誠<sup>5</sup>、渋谷 岳造<sup>2</sup>、高井 研<sup>2</sup>、高野 淑識<sup>2</sup>、矢野 創<sup>3</sup>

\*Fujishima Kosuke<sup>1</sup>, Wataru Takahagi<sup>2,4</sup>, Kaito Seo<sup>4</sup>, Hiroki Saito<sup>4</sup>, yayoi Hongo<sup>1</sup>, Makoto Tabata<sup>5</sup>, Takazo Shibuya<sup>2</sup>, Ken Takai<sup>2</sup>, Yoshinori Takano<sup>2</sup>, Hajime Yano<sup>3</sup>

1. 東京工業大学 地球生命研究所、2. 海洋研究開発機構、3. 宇宙航空研究開発機構 宇宙科学研究所、4. 慶應義塾大学、5. 千葉大学大学院理学研究院

1. Tokyo Institute of Technology, Earth-Life Science Institute, 2. Japan Agency for Marine-Earth Science and Technology, 3. Japan Aerospace Exploration Agency, Institute of Space and Astronautic Science, 4. Keio Univ., 5. Graduate School of Science, Chiba University

Understanding the variety and the distribution of the building blocks of life in space is one of the important scientific themes for Astrobiology. *In situ* detection of organic molecules from extraterrestrial bodies thus provide insight into ongoing chemical evolution of building blocks of life, and possibly the detection of extraterrestrial life itself. Here we conducted a ground-based simulation of Enceladus fly-through plume sampling, extraction and analysis of two simple organic molecules, Glycine (Gly) and Glycyl-L-alanine (GlyAla) dipeptide. Hypervelocity impact experiment was carried out at JAXA/ISAS using pure Gly and GlyAla crystal as well as freeze-dried sample of 10% w/w organic-NaCl mixture. Approximately 5 mg of powder samples are placed into sabot projectile and accelerated to a speed of 4-6 km/sec and captured by ultra-low density (10 mg/cc) hydrophobic and hydrophilic silica aerogels. Aerogels with impact tracks are transferred to order-made aerogel container made of space compatible material polyetheretherketone (PEEK) and soaked by 5 ml 75% acetonitrile water solution for sufficient diffusion of organic molecules. Extracted solution was freeze-dried and resuspended in 100  $\mu$ l water and analyzed using LC-QTOF-MS. So far, we have obtained LC profile/MS spectra corresponding to intact GlyAla from both hydrophobic and hydrophilic aerogel with sample recovery rate of approximately 0.1%. Ongoing analysis will further provide information on Glycine as well as degree of impact-driven organic alteration to demonstrate the capability ultra-low density aerogel for analysis of astrobiologically-relevant organic molecules in future spaceflight missions.

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