Simulated Enceladus fly-through experiment using aerogel and peptides

*Fujishima Kosuke[1,2], Sota Numaho[3,5,4], Wataru Takahagi[4,2,3], Takazo Shibuya[4], Masaru Tomita[5,3], Ken Takai[4], Yoshinori Takano[4], Hajime Yano[6]

1. Tokyo Institute of Technology, Earth-Life Science Institute, 2. Graduate School of Media and Governance, Keio University, 3. Institute for Advanced Biosciences, Keio University, 4. Japan Agency for Marine-Earth Science and Technology, 5. Department of Environment and Information Studies, Keio University, 6. Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency

One of the main goals for Astrobiology is to understand the limits and distribution of life in the universe. *In situ* detection of organic molecules in the extraterrestrial environment thus provides an important step towards better understanding of the variety, distribution and chemical evolution of the organic building blocks of life that could ultimately lead to the detection of extraterrestrial life within our Solar System. Here we performed a concept study for the Enceladus fly-through plume sampling and extraction using eight different short peptides as a candidate biomolecules. Hypervelocity impact experiment was carried out at JAXA/ISAS with peptide-bearing micro-silica particles accelerated to a speed of 2-6 km/sec and captured by ultra-low density (0.01 g/cm_3) hydrophobic and hydrophilic aerogels respectively. Each of the eight peptides possesses unique hydrophobicity/hydrophilicity properties with a C-terminal tyrosine residue for UV detection. We are currently testing different extraction procedures and analyses to understand whether difference in the chemical properties of aerogels and peptides affect the overall extraction efficiency. Furthermore, we will evaluate the impact-driven degradation and alteration of peptides to discuss the likelihood of aerogel application for future *in situ* life detection mission on icy moons.

Keywords: Icy Moon, Aerogel, Life detection, Peptide

