METHOD FOR BIOLOGICAL CONTAMINATION MONITORING DURING AEROGEL CUTTING PROCESS IN TANPOPO PROJECT USING BIOLUMINESCENT BACTERIA *Photobacterium kishitanii*.

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Introduction: The Tanpopo mission is a Japanese astrobiological experiment which will be conducted on the Japanese Experiment Module (JEM) of the International Space Station (ISS) [1]. One of the goals of the Tanpopo mission is to capture microbes in space, possibly attached on the surfaces of micrometeoroids or space debris at the ISS orbit (approximately 400 km altitude). For this purpose, an excellent but fragile media called "silica aerogel" tiles will be used [2]. After the experiment, aerogel samples that possibly contain tracks with microbes/microbial DNA will be devided to regions using a device called "YOUKAN machine", and offered for PCR analysis. As PCR process amplifies any sort of microbial DNA, biological contamination of the returned sample in the curation laboratory must be strictly eliminated. To develop a suitable cutting method, biological contamination of returned aerogel during the proess should be monitored. In other words,

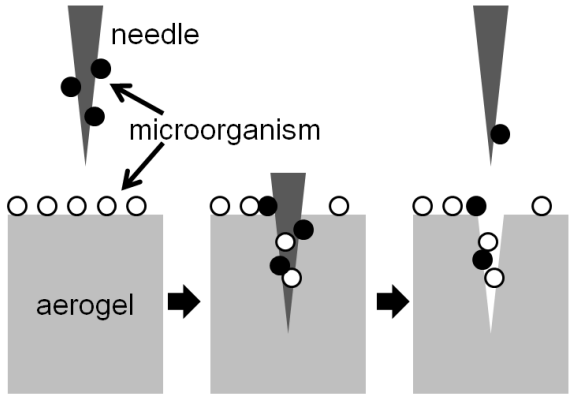

Fig. 2 Possible biological contamination.

sources (space or Earth) of microbes found in/on the returned aerogel sample should be clearly distinguished. In this report we focused on the measurement of microbes that should be dragged from the aerogel surface into the hole with the motion of the cutting needle. To measure only microbes from the aerogel surface (not those from the needle surface, etc.), here we report the use of bioluminescent bacteria, *Photobacterium kishitanii*.

Bioluminescent bacteria *Photobacterium kishitanii* : Among several bioluminescent bacteria, *P. kishitanii* emits strongest light with the peak wavelength of 475 nm. Methods for the attachment of this bacteria on the glass surface were studied, and continuous measurement of the luminescence were performed [3]. Measurement of luminescence from one single cell was also possible [4]. Here in this report *P. kishitanii* cells will be used as models of microbe attached on the cutting needle of aerogel.

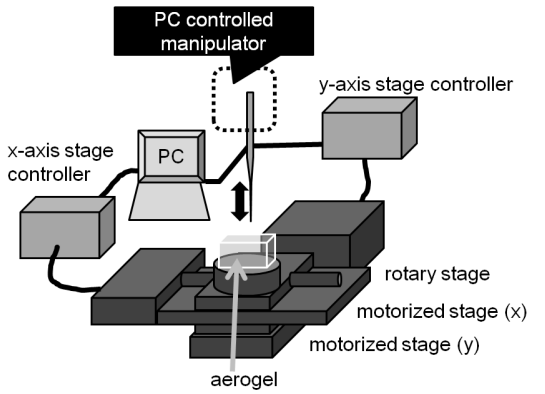

Fig. 1 Schematic illustration of YOUKAN machine.

YOUKAN machine BBM: We performed cutting experiment in a way similar to the one used in STARDUST mission by NASA [5], where the cutting needle vertically moved back and forth in z axis, together with the horizontal movement of aerogel fixed on x-y stage (Fig. 2).

Contamination measurement: Firstly, P. kishitanii suspension was attached on the top surface of the aerogel, followed by the repeated pricking. Secondly, the bacterial suspention was attached on the needle surface only. After the pricking the luminescence from the bacteria in holes was measured using a luminescence counter. Effect of the speed, shape and attached cell number on the contamination will be reported.

References: [1] Yamagishi A. et al. 2009. Trans. JSASS Space Tech. Jpn. 7: Tk 49-Tk 55. [2] Tabata M. et al. 2011. Biol. Sci. Space. 25: 7-12. [3] Sasaki S. et al. 2012. Chem. Lett. 10: 1213-1214. [4] Sasaki S. et al. 2009. Lett. Appl. Microbiol. 48:313-7 [5] Westphal A. J. et al. 2004. Meteorit. Planet. Sci., 39: 1375-1386.