Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

BAO01-P08 Room:Poster Time:April 28 18:15-19:30

Studies on life detection methods by using enzymatic activities: Phosphatase and Catalase

AOKI, Kohei[1*] ; KURIZUKA, Taihei[1] ; OBAYASHI, Yumiko[1] ; OGAWA, Mari[2] ; YOSHIMURA, Yoshitaka[4] ; MITA, Hajime[3] ; NAVARRO-GONZALEZ, Rafael[5] ; KANEKO, Takeo[1] ; KOBAYASHI, Kensei[6]

[1]Graduate School of Engineering, Yokohama National University, [2]Faculty of Education, Yasuda Women's University, [3]College of Agriculture, Tamagawa University, [4]Faculty of Engineering, Fukuoka Institute of Technology, [5]National Autonomous University of Mexico, [6]Yokohama National University and Natural Institutes of Natural Sciences

We have recognized that microorganisms can survive in such extreme environments as polar environments, deserts, hot springs and stratosphere. It is quite difficult to evaluate microbial activities in extreme environments, since most microorganisms in extreme environments are hard to cultivate. We are discussing how to detect microorganisms in extreme environments including Mars. In MELOS mission, a proposed Japanese Mars exploration, fluorescence microscope will be applied to life detection. In addition to the technique, we examined amino acid analysis and enzyme assay as possible chemical strategies for life detection in terrestrial and extraterrestrial extreme environment.

One of the most well studied enzymes in environments is phosphatase. Phosphatases hydrolyze phosphate esters to produce phosphate that is essential for terrestrial life, and they are known to be stable in environments. We assayed rocks and soils in extreme environments such as submarine hydrothermal core samples and Antarctic soil samples, and found that it can be a good indicator for microbial activity. Here we analyzed phosphatese activity in Atacama Desert soil samples. Atacama desert is know to be one of the driest and harshest environments on the Earth, and regarded as Mars simulant. Samples were collected in 2002 by USA-Mexico team. Phosphatase activity was correlated to precipitation rate.

Such extreme environments as Mars, Antarctica and deserts have commonalities. Strong UV causes formation of peroxides that will damage bioorganics. Thus, we supposed that catalase and peroxidase are quite important for the survival of organisms living there, and it would be a good biomarker. We are now studying the assay methods for catalase in soil samples.

Keywords: extreme environments, Mars, life detection, enzymatic activities, phosphatase, catalase