

Life Detection Microscope: Search for Microbes on the Mars Surface with a Fluorescent Microscope

YAMAGISHI, Akihiko^{1*} ; SATOH, Takehiko² ; ENYA, Keigo² ; MIYAKAWA, Atsuo¹ ; SASAKI, Satoshi³ ; YOSHIMURA, Yoshitaka⁴ ; HONDA, Hajime⁵ ; DEMURA, Hirohide⁶ ; IMAI, Eiichi⁵ ; USUI, Tomohiro⁷ ; FUJITA, Kazuhisa⁸ ; ISHIGAMI, Genya⁹ ; OZAWA, Takashi⁸ ; OHNO, Sohsuke¹⁰ ; SASAKI, Sho¹¹ ; MIYAMOTO, Hideaki¹²

¹Tokyo University of Pharmacy and Life Sciences, ²ISAS/JAXA, ³Tokyo University of Technology, ⁴Tamagawa University, ⁵Nagaoka Univ. Tech., ⁶The University of Aizu, ⁷Tokyo Institute of Technology, ⁸JAXA, ⁹Keio University, ¹⁰Chiba Institute of Technology, ¹¹Osaka University, ¹²The University of Tokyo

Past trial of direct detection of life on Mars by 1970's Viking mission reported a negative conclusion, whereas numbers of circumstances provided by recent Mars exploration missions in the last decade indicate that there are good reasons to perform another life detection program.

Here we propose Life Detection Microscope that has much higher sensitivity than the instrument onboard Viking. Indeed Life Detection Microscope (LDM) that we propose here could detect less than 10⁴ cells in 1 gram clay. Our life detecting instrument has the sensitivity that is three orders of magnitude higher than the one onboard Viking that issued the negative conclusion. LDM is capable of identifying what we think to be the most fundamental features that a cell should possess to constitute life.

Our Investigation Goals are:

- 1: High-resolution characterization of regolith and dust particles.
- 2: Search for any type of organic compounds in Mars surface samples. The compounds include cells, other biological materials, and abiotic polycyclic aromatic hydrocarbon (PAH).
- 3: Identify cell-like structure in which organic compounds are enveloped by membrane, which may represent Martian life.

Keywords: Mars, Life search, Fluorescence microscope, Microbe, Organic compounds