

Investigation of optimum density of fluorescent dyes used for Life Detection Microscope on Mars surface

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In the Viking mission performed on Mars in 1970s, no appreciable organic compound was detected¹⁾. However, the detection sensitivity of organic compound of Viking TV-GC-MS was found to be too low to detect microbes in the area with low density of microbes on Earth, such as Atakama desert.

The Curiosity: Mars Science Laboratory (MSL) of NASA detected organic matter in the Gale Crater on Mars²⁾. H₂O ice was discovered in Phoenix mission³⁾. The seasonal appearance of black lines on the slope of craters called Recurrent Slope Lineae (RSL) were observed by Mars Reconnaissance Orbiter (MRO)⁴⁾, which may be related some water activities. These suggest the possible presence of life on Mars.

Yamagishi and his colleagues have proposed a Mars exploration mission for *in situ* life detection by directly observing cells and organic matters in the soil on the surface of Mars with a fluorescence microscope⁵⁾. The microscope was named as Life Detection Microscope (LDM). The LDM has the sensitivity 1000 times higher than that by Viking apparatus. We plan to use two fluorescent dyes, SYTO24 and Propidium Iodide (PI), in LDM. SYTO24 can be transported across the cell membrane and stains organic matter locating both outside and inside of cells. PI can not be transported across the cell membrane nor can stain in side of cells. By using these two dyes, it is possible to judge the presence or absence of organic matter and whether the latter be the living or dead cells.

We have determined the optimum concentrations of PI and SYTO 24 for LDM and report our progress on the development of LDM.

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