

Characterization of Martian Regolith: Toward 2020s Mars Exploration Missions

USUI, Tomohiro^{1*}; YAMAGISHI, Akihiko²; SATO, Takehiko³; MIYAMOTO, Hideaki⁴; KAMEDA, Shingo⁵; FUJITA, Kazuhisa³; SEKINE, Yasuhito⁴; TACHIBANA, Shogo⁶; WATANABE, Sei-ichiro⁷

¹Tokyo Institute of Technology, ²Tokyo University of Pharmacy and Life Science, ³ISAS, JAXA, ⁴The University of Tokyo, ⁵Rikkyo University, ⁶Hokkaido University, ⁷Nagoya University

Mars once had surficial liquid water (paleo-ocean/lake) and shows a promising sign of current subsurface water/ice. The existence of hydrosphere and cryosphere makes Mars the unique accessible habitable planet next to the Earth. The water-rock interaction between the lithosphere and hydrosphere/cryosphere through the history of Mars has produced a variety of surface rocks (regolith) containing sheet-silicates, phosphates, sulfates, and carbonates, which are closely linked to climate and the potential for life on Mars. This study characterizes the physico-chemical properties (chemical composition, mineral abundance, reflectance feature, and geometric distribution) of Martian regoliths. We further present a way to leverage the database on Martian regoliths as a tool for interpreting remote sensing analyses by onboard instruments (e.g. Life Detection Microscope) for Mars exploration missions in 2020s.

Keywords: Mars, regolith