Influence by the Temperature Dependences of the Reflectance Spectra of Hydrated Salts, and Laser Irradiation

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It is important for knowing the process of chemical and physical evolution on Europa to investigate hydrated salts. Those reflectance spectra were obtained by Galileo's NIMS(Near-Infrared Mapping Spectrometer) and many studies have been done for these spectra. But, temperature dependences of reflectance spectra of such minerals have not been measured in detail. We measured reflectance spectra of epsomite, mirabilite and mixture of them which are the most leading substances as candidates exposed from European sea, at the temperature range 60K-140K. This range includes the surface temperature not only of Europa but also of other icy bodies more distant from the Sun. And we investigated how the temperature change affects these reflectance spectra. Moreover, we confirmed whether, on Europa surface, heating ions and dusts from Jupiter are influential to these spectra or not, by laser irradiation. The result is that, in the temperature 60K-140K, it turns out that remarkable changes for these spectra are not found, and there is also almost no change by laser irradiation. Therefore, we can apply the form of these spectra also to other icy bodies having lower temperature than Europa. Using these spectra could check the possibility that a body may have the sea now or before under the icy crust. In this study, we also noticed the important fact that when measuring the reflectance spectra of very small particle sample at vacuum, vibration from the vacuum pomp causes equalization roughness of the sample surface or making it condense, and has very big influence on reflectance. It means that the surface conditions of samples have much effect on reflectance spectra.