Toward innovative asteroid mineralogy: comparative study of asteroid and meteorite spectra in the 3-micron band

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*臼井 文彦[1]、長谷川 直[2]、大坪 貴文[2]、中村 智樹[3]
*Fumihiko Usui[1], Sunao Hasegawa[2], Takafumi Ootsubo[2], Tomoki Nakamura[3]

1. 神戸大学大学院 理学研究科 惑星科学研究センター、2. 宇宙航空研究開発機構 宇宙科学研究所、3. 東北大学大学院 理学研究科 地学専攻
1. Kobe University, 2. ISAS/JAXA, 3. Tohoku University

The knowledge of hydrated minerals among asteroids is important for a broad understanding of solar system formation, evolutionary processes, and thermal history. Hydrated minerals have significant absorption feature around 2.7 micron due to O-H stretching mode, although not many studies have been done to compare asteroids with meteorites in this wavelength. That is because (a) observations with ground-based telescopes cannot see in the near-infrared wavelengths continuously due to atmospheric absorption, especially in 2.5-2.85 microns, and (b) spectral measurements of meteorites in the laboratories are severely suffered from contamination of atmospheric water that is absorbed on and rehydrated to samples under ambient terrestrial conditions. Recently this situation has been improved by (a) the infrared space telescope AKARI covered spectroscopically in 2.5-5 microns, and (b) the heating experiments in the laboratory to remove effects of adsorbed/rehydrated water. In comparing telescopic spectra of C-type asteroids and laboratory spectra of carbonaceous chondrites, we have found some matches, suggesting that some of these asteroids and meteorites have similar mineralogy, and possibly experienced analogous processes of hydration and dehydration after formation.

In this talk, we present the results of telescopic observations of asteroids in the 3-micron band and experimental analyses of meteorites, and discuss spectral match of these two.

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