SPECTRAL MAP ANALYSIS OF BROWN OLIVINE IN MARTIAN METEORITES BY MICRO FT/IR.

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Among about 50 martian meteorites found so far, some meteorites, especially shergottites contain brown colored olivines. The cause of this "brown" color was originally thought to be the oxidization process of olivine from Fe^{2+} to Fe^{3+} due to shock event [1], however, recent TEM works have revealed that the nano-phase Fe-Ni metal or magnetite in olivine, probably formed by shock events, change olivines to "brown" [2-3]. Pieters et al. [2] performed visible and near-infrared, midinfrared and other spectral studies on brown olivines in NWA2737 chassignite and ALH77005 lherzolitic shergottite, and they reported that the VNIR spectrum did not show the characteristics of olivine, but the midinfrared spectra revealed the characteristics of crystalline forsteritic olivine. In our previous work [4], we revealed that the micro FT/IR analysis of 40 μm square aperture on the PTS samples can recognize the spectral characteristics of brown olivines by midinfrared wavelength, and also found that the peak of reflectance spectrum around 1050 cm^{-1} (approximately 9500 nm) seems to correspond to the darkness of olivine. To confirm this relativeness, we performed the map analysis of micro FT/IR on the brown olivines of martian meteorites.

We analyzed LAR06319 (LAR) olivine-phyric shergottite, LEW88516 (LEW) and Y000097 (Y97) lherzolitic shergottites because their olivines show patchy darkness distribution. The PTSs of these samples were analyzed by JASCO IRT-3000 micro FT/IR. Analyzed wavenumber ranges from 350 cm^{-1} to 7800 cm^{-1}, cumulated number is 30, and micro aperture is from 40 μm x 40 μm to 100 μm x 100 μm. After measurement of spectrum, colored reflectance map images of the particular wavenumber were created as post-processing**.** The obtained maps of patchy brown olivine in shergottites reveal that the darkness of olivine colors and the reflectance around 1050 cm^{-1} show good accordance. These results support the idea that the reflectance of around 1050 cm^{-1} has relation to the darkness of olivine color [4], and in fact, such reflectance seems to correspond to the shock pressure. Although olivines from the shock experiments at 40 GPa contained nano-phase particles, the color of such olivine was rarely changed [3]. Spectral studies on olivine from further shock experiments might be able to draw the correlation curve between shock pressure and reflectance of particular wavelength, and can be a good marker of the pressure values.

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