**CATHODOLUMINESCENCE CHARACTERIZATION OF MASKELYNITE AND ALKALI FELDSPAR IN SHERGOTTITE.** M. Kayama[1], T. Nakazato[1], H. Nishido[1], K. Ninagawa[2] and A. Gucsik[3] [1]Research Institute of Natural Sciences, Okayama University of Science 1-1 Ridai-cho, Okayama, 700-0005, Japan (kayama0127@gmail.com), [2]Department of Applied Physics, Okayama University of Science 1-1 Ridai-cho, Okayama, 700-005, Japan, [3]Max Planck Institute for Chemistry, Department of Geochemistry, Joh.-J. Becherweg 27, D-55128 Mainz, Germany.

**Introduction:** Martian meteorite of shergottite is regarded as one of the meteorites induced by highest shocked pressure, which causes phase transformation of plagioclase into maskelynite. It has been severely shocked and is considered a "type material" for maskelynite. Cathodoluminescence (CL) features such as CL intensity and peak position are related to composition, concentration of luminescence center and crystal fields, which can be altered by the pressure produced by shock metamorphism such as impact events. In this study, CL spectroscopy and microscopy of maskelynite and alkali feldspar in shergottite (Dhofar 019 and Shergotty) were carried out. These results have been compared to CL data for experimentally shocked plagioclase to interpret shock pressure effect on CL properties of these samples.

**Sample and Methods:** Polished thin sections of shergottite (Dhofar 019 and Shergotty) were selected for CL and Raman measurements. Shergotty exhibits of dull gray-green pyroxene prisms up to 1 cm long with colorless lath-like and interstitial vitreous maskelynite, which replaced the feldspar [1]. Dhofar 019 is classified as an olivine-bearing basaltic shergottite consists of subhedral grain (0.2-0.5 mm) of pyroxene (pigeonite and augite), olivine and feldspar mostly converted to maskelynite and minor alkali feldspar, merrillite, chromite, ilmenite and pyrrhotite, associated with terrestrial secondary phases. Shock pressures of these shergottites were qualitatively estimated in the range of 30-35 GPa for Dhofar 019 and above 40 GPa for Shergotty [1-3].

**Results and Discussion:** CL spectra of maskelynite in Dhofar 019 and Shergottite exhibit two broad band peaks at around 400 and 600 nm, which can be assigned to self-trapped exciton (STE) and $Mn^{2+}$ impurity center, respectively. Similar blue emission at around 400 nm is observed in only plagioclase experimentally shocked at 40 GPa. It implies that a broad band peak at around 400 nm is characteristic of maskelynite. Futhermore, a broad band at around 600 nm in maskelynite shows rather weak intensity compared to terrestrial plagioclase.

CL spectra of alkali feldspar in Dhofar 019 and Shergottite have a broad band peak at around 400 nm, whereas terrestrial alkali feldspar actually consists of broad band peaks at around 400 (defect center) and 750 nm ($Fe^{3+}$ impurity center).

Both of maskelynite in Dhofar 019 and Shergottite show a weak and broad Raman spectral peak at around 450 $cm^{-1}$, which is related to T-O-T symmetrical stretching vibration, although a terrestrial plagioclase has pronounced and narrow Raman spectral peaks at around 170, 280, 480 and 510 $cm^{-1}$. Raman spectra of alkali feldspar in Dhofar 019 and Shergotty also have a broad peak at 500-600 $cm^{-1}$, whereas terrestrial counterpart shows pronounced and narrow Raman peaks at 280, 400, 470, 520 and 1120 $cm^{-1}$. It indicates that high shock pressure at 40 GPa converts plagioclase into maskelynite accompanied by highly deformed or partly amorphous state in alkali feldspar. This phenomenon eliminates their luminescence centers, responsible for weak CL intensities of maskelynite and alkali feldspar in Dhofar 019 and Shergotty compared to terrestrial samples and disappearance of a broad band peak at around 750 nm for alkali feldspar in these meteorites.

**References:**

[1] http://curator.jsc.nasa.gov/atmet/mmc/index.cfm
[2] Badjukov D. D et al. (2001) *LPS XXXII*, Abstract #2195. [3] Taylor L. A et al. (2002) *Meteoritics & Planetary Science*, 37, 1107–1128.

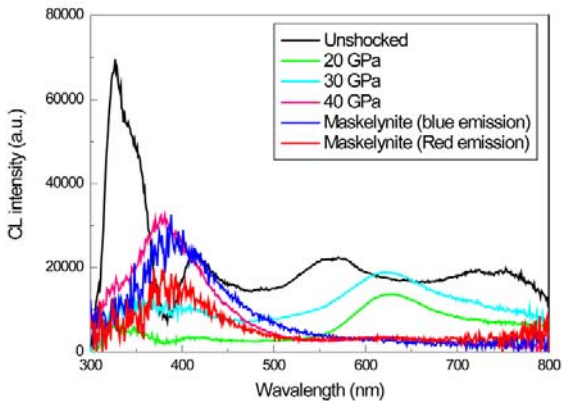


Fig. 1 CL spectra of unshocked and experimentally shocked plagioclase at 20, 30 and 40 GPa and maskelynite in Dhofar 019.