

Cathodoluminescence Study of Shocked Ordinary Chondrites

Kiyotaka Ninagawa[1]; Megumi Michizawa[2]; Kouichiro Noritake[3]; Masahiro Kayama[4]; Shin Toyoda[5]; Hirotsugu Nishido[4]

[1] Applied Phys. Okayama Univ. of Science; [2] Applied Physics, Okayama Univ. of Science; [3] Applied Physics, Okayama Univ. of Science; [4] Res. Inst. Nat. Sci., Okayama Univ. Sci.; [5] Dept. Appl. Phys., Okayama Univ. Sci.

Cathodoluminescence (CL) emission is generated by impurities and defects in minerals. Then CL will be a useful tool to study shock metamorphism of ordinary chondrites. In this study we measured the CL of unshocked ordinary chondrite (Bjurböle, L4, S1), weakly shocked ordinary chondrite (Ashmore, H4, S3), and heavy shocked ordinary chondrite (Dar al Gani 528, L6, S6) [1].

CL images of them were obtained by Luminoscope, ELM-3. Mesostases of Bjurböle (L4, S1) and Ashmore (H4, S3) show almost blue CL. On the other hand, mesostases of Dar al Gani 528 (L6, S6) exhibit blue and yellow CL. CL spectra of these ordinary chondrites were also measured by a Scanning Electron Microscope (SEM), JEOL 5410LV, equipped with a CL detector, Oxford Mono CL2 using a photomultiplier, Hamamatsu Photonics R2228. CL spectra were measured at several mesostases points of Ashmore (H4, S3). They have the same shape of 470 nm peak and gradual decrease at long wavelength region. Bjurböle (L4, S1) has relatively stronger CL intensity than Ashmore, and two spectral types. One has a peak at 500 nm, and another has a peak at 560 nm peak in spite of blue CL observation by the Luminoscope. Shapes of both spectra have a little bit of bulges. The photomultiplier R2228 has a high sensitivity around 600 nm. It seems that this PM characteristics make peaks at longer wavelength in spite of blue CL observation. Dar al Gani 528 (L6, S6) has relatively weaker CL intensity than Ashmore. Blue CL of them shows two spectral types. One is the same shape as that of Ashmore with 470 nm peak. Another has a peak at 430 nm and sharp decrease on long wavelength side. Yellow CL has the weakest CL intensity with 590 nm peak.

CL intensity decreased according to Bjurböle (L4, S1), Ashmore (H4, S3) and Dar al Gani 528 (L6, S6). High shock pressure made decrease of CL intensity. This feature resembles to thermoluminescence (TL) property by shock. TL sensitivity is decreased by shock [2, 3]. Two types of CL spectra in unshocked Bjurböle (L4, S1) may be due to original CL property of mesostases in the chondrite. On the other hand, three types of CL spectra in heavy shocked ordinary chondrite (Dar al Gani 528, L6, S6) may be due to local shock degree in the chondrite.

References

- [1] Stöffler D., Keil K. and Scott E. R. D. (1991) *Geochim. Cosmochim. Acta* 55, 3845-3867.
- [2] Sears D. W., Ashworth J. R., Broadbent C. P. and Bevan A. W. R. (1984) *Geochim. Cosmochim. Acta* 48, 343-360.
- [3] Hartmet, C. P., R. Ostertag and D. W. G. Sears (1986) *Proc. 17th Lunar Planet. Sci. Conf. Part I; J. Geophys. Res.* 91, E263-E274.