# Determination of Paleoclimate by Hydrogen Isotopes of Water from Fluid Inclusions

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It is well known, that for water isotopic composition of precipitation and meteoric water on continents there is correlation between $\delta D$ and $\delta^{18}O$, described by the equation $\delta D = 8\ \delta^{18}O + 10$ ‰[1]. It was also noticed that the most "heavy" meteoric waters are found in low latitudes. At the same time, the farther from the equator the lighter the isotopic composition of meteoric water becomes. Numerous investigations have show that isotopes hydrogen, kept in rock and minerals in the crystal water or $OH^-$ -group in most cases corresponds to that of local meteoric water, i.e. marks the same geographic effect [2].

The water of fluid inclusions from the very moment of their formation is in "preserved" state. As it has been shown above, it indicates the meteoric water' isotope composition at the moment of inclusion and mineral formation. So, according to the author, the isotope composition of water in the fluid inclusions can be used to determine paleolatitude of their forming and therefore paleoclimate.

The author has been studying Parnokskoye iron-manganese deposit (Polar Urals). The studies of isotope water composition of hypergenic minerals have shown that their _D is –130 to –170‰ (SMOW) which is typical for the meteoric water of the circumpolar latitudes. Along with the sediment protores of the deposit there are numerous metamorphogene mineral forms represented mainly by manganocalcite.

The studies of the isotope composition of hydrogen of water in manganocalcite fluid inclusions showed that $\delta D$ = -70‰ (SMOW). At the same time, it was found that F/Cl ratio for metamorphogenic fluids is equal to 0,176 and is higher than the analogous equation in the sea in 20000 times. The observation in question make it possible to state that it was not the sea water which had formed manganocalcite. The isotopic composition of the water of the inclusions is typical of the latitudes of modern Middle Asia. Thus, the paleolatitude of manganocalcite forming is estimated as 30-40° North.

## References

[1] CRAIG, H. (1961). Science, 1702-1703.

[2] Stable Isotopes as Applied to Problems of Ore Deposits: Economic Geologists: vol. 69, 1974, N 6.

# Cathodoluminescence study of a shocked ordinary chondrite

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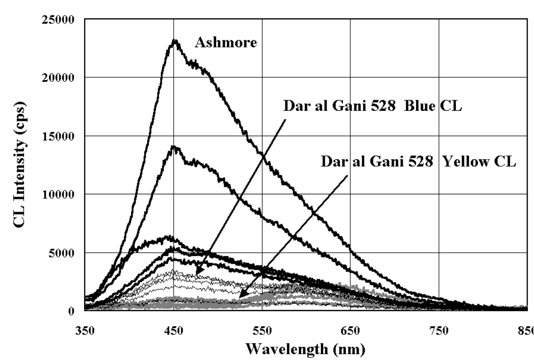
## Introduction

Cathodoluminescence (CL) is sensitive to impurities and defects in crystal. Then CL will be a useful tool to study shock metamorphism of meteorites. This time we measured the CL of heavy shocked ordinary chondrite; Dar al Gani 528 (L6, S6) and weakly shocked ordinary chondrite; Ashmore (H4, S3).

## Results

CL images of them were obtained. Dar al Gani 528 shows blue and yellow CL. Ashmore exhibits blue CL only. CL spectra of both ordinary chondrite were also studied. Blue areas of Ashmore show a high CL peak of 450 nm extending to the long wavelength range. On the other hand, blue CL areas of Dar al Gani 528 have two broad peaks of 450 and 600 nm. However, the peak of 450 nm is higher than that of 600 nm, and the former peak intensity is overall lower than that of Ashmore. Yellow CL areas of Dar al Gani 528 contain two peaks of 450 and 600 nm. But the peak intensity of 450 nm is relatively lower than that of 600 nm.




## Conclusion

Because of shock metamorphism, the peak intensity was decreased significantly at 450 nm (moderately at 600 nm) in plagioclase, resulting a relatively yellowish CL.

## References

Dodd R. T. and Jarosewick E. (1979) Earth Planet. Sci. Lett. **44**, 335-340.

Stöffler D., Keil K. and Scott E. R. D. (1991) Geochim. Cosmochim. Acta **55**, 3845-3867.

Sears D. W., J.R.Ashworth, C.P.Broadbent and A.W.R.Bevan (1984) Geochim. Cosmochim. Acta **48**, 343-360.

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.