Organic carbon from the Tissint Martian Meteorite: Hints for biogenic origin

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Organic carbon was found in Tissint, the new Martian meteorite fall [1], most filling fractures and a few entrained in shock-melt veins. The organic carbon is kerogen-like based on Raman spectra. Some organic carbon inclusions in the veins were transferred to diamond. The organic carbon has been analyzed with NanoSIMS 50L. The abundances of H, N, O, S, P , F and Cl relative to C of the organic carbon are comparable with coal. The organic carbon grains have $\delta^{13}C$ values of -13.0 ~ -33.3‰, δD values of up to +1183‰ and normal N isotopic compositions.

The organic carbon in Tissint is of Martian origin, based on the presence in the shock-melt veins, the formation of diamond and the D-enrichment. It formed by depositing from organic-rich groundwater on Mars. The petrographic settings and significantly light C isotopes of the organic carbon are consistent with a biogenic origin. Our observations of the organic carbon argue against an igneous origin [2]. The organic carbon couldn't originate from carbonaceous chondrites that impacted on Mars, because the chondritic kerogen has heavier N isotopes and relatively homogeneous H isotopes.

[1] Chennaoui A., H. , *et al*.. 2012. *Science* 338: 785-788.
[2] Steele A., *et al*.. 2012. *Science* 337: 212-215.

Precise Determination of B Isotopic Compositions in Low Concentration Carbonates and Fluids Using Micro-sublimation MC-ICPMS

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Although the pH-dependence of boron (B) isotopic fractionation in marine carbonates has been widely used for pH reconstruction in ancient seawater, the available analytical techniques still exhibit large discrepancies. In this study, we evaluated systematically the B isotopic compositions in two reference materials, JCp-1 (porites coral) and JCt-1 (giant clam). A low blank boron separation procedure was evaluated using micro-sublimation technique [1], subsequently combined with MC-ICPMS isotopic measurement. The two carbonate standards were treated with oxidative cleaning (NaOCl) and without any prior cleaning for comparison. There is no major B isotopic difference between the two groups; however, the cleaned carbonates show slightly lower $\delta^{11}B$ with better precision. These $\delta^{11}B$ results agree well with literature values, but achieve with high throughput and high precision (2SD, 0.2 ‰).

Boron isotopic fractionation during sorption is rather significant in soils and river water. Our $\delta^{11}B$ technique was applied further for a better understanding of clay adsorption/ desorption behaviors of B in aqueous environments, as well as the associated isotopic fractionation during water/rock interaction. The calculated K_Ds and the degree of B isotopic fractionation showed significant variation among various minerals.

[1] Wang *et al*.., 2010 Talanta **82** 1378–1384