EFFECTS OF AQUEOUS ALTERATION ON THE FREE ORGANIC MATTER IN SEVERAL CR CHONDRITES BY ESI-ORBITRAP-MS.

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Introduction: Carbonaceous chondrites underwent aqueous alteration very early in their geological history [1], along with very limited thermal metamorphism [2]. Some CR-type chondrites exhibit none or little alteration compared to CI and CM [3], [4]. The characterization of the hydrothermalism fingerprints in volatile compounds is mandatory to put constraints on the extent of asteroidal organic chemistry. Isotopic markers in silicates systematically attest to variable exchange with water [4]. This equilibration is similar to the one highlighted in the organic matter from different lithologies of Tagish-Lake [5]. Independent study reports spatial correlation with alteration mineral phases and the soluble organic matter in several chondrites classes [6].

We report on the analysis of the soluble organic fraction extracted from 4 CR: QUE 99177, MET 00426, EET 92042, GRA 95229 in order to describe their evolution and mobility as the degree of aqueous alteration increases.

Method: Each rock was first macerated in water for 24h to extract organic matter that could have been mobilized during hydrothermalism. The supernatant was evaporated at 30°C under vacuum and resolubilized in 1/3 Methanol + 2/3 Toluene mixture for analysis. The solid leftover was then macerated in the same solvent for 24h for comparison with Murchison extracts [7], [8]. Very high resolution mass spectra were acquired with a Thermo LTQ Orbitrap XL at its highest resolving power, coupled with Electrospay ionization (ESI) source both for cations and anions.

Results: The water insoluble extracts (WIOM) of the whole sample set exhibits similar diversity and complexity. As for Murchison [7], it can be described as a consistent mixture of 8 to 35 carbons branched chains with 1 or 2 heteroatomic functions. On contrary, the water soluble counterpart (WSOM) splits the set into 2 groups. QUE 99177 and MET 00426 released a molecular family that is highly variable in heteroatoms O and S and not observed in EET 92042 or in GRA 95229. In the 4 samples, the lightest molecules of the WIOM are also detected on the WSOM.

The striking difference in heteroatomic content in the water soluble is consistent with a lesser alteration in QUE 99177 and MET 00426 [4] that left the most mobile organics in place.

This work has been supported by a grant from Labex OSUG@2020 (Investissements d'avenir – ANR10 LABX56)

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