OXIDATION DEGREE OF SULFUR AND OXYGEN ORGANIC FUNCTIONS IN THE IOM OF AQUEOUSLY ALTERED CHONDRITES.  F. R. Orthous-Daunay1, E. Quirico1, L. Lemelle2, P. Beck1, V. de Andrade1, A. Simionovici2, S. Derenne2, B. Schmitt1. 1L.P.G. CNRS/UJF BP53 38041 Grenoble Cedex9 France E-mail : forthous@ujf-grenoble.fr 2E.N.S. CNRS 46 allée d’Italie 69009 Lyon France 3ID21 Beamline ESRF BP220 38043 Grenoble 4LGCA CNRS/UJF BP53 38041 Grenoble 5BioEMCo CNRS/UPMC 4 place Jussieu 75252 Paris Cedex5 France

Introduction: Carbonaceous chondrites of types 1 and 2 like CIs, CMs, CRs and Tagish Lake contain a few percent of insoluble organic matter (IOM) which could provide clues on the organic chemistry of nebular and/or protostellar environments. These chondrites also have experienced complex hydrothermal processes on parent bodies [1-3]. A major issue is the understanding of IOM compositional and structural changes due to hydrothermalism. Chemical variability has been reported among various IOMs, and so far interpreted as the consequence of oxidation processes [4; 5]. Nevertheless, it cannot be excluded that chemical diversity of organic precursors might contribute in the IOMs observed differences.

Methods: We extracted eleven IOMs from three CI1: Ivuna, Orgueil, Alais; six CM2: Murchison, Cold Bokkeveld, QUE9355, QUE9390, Mighei, Murray; one CR2: Renazzo; and one C2 ungrouped: Tagish Lake. We used a HF/HCl treatment adapted for a continuous flux filtration process to remove most of minerals and soluble organic molecules. IOM grains are picked and flattened on BaF2 windows or Ultralene® foils for measurement. We acquired mid-infrared (IR) spectra from 700 to 4000 cm⁻1 with a Bruker Hyperion3000 microscope at the L.P.G. and Sulfur K-edge X-ray absorption near edge structure (XANES) spectra from 2450 to 2500 eV on the ID21 beamline at the ES.R.F. in Grenoble, France. We have probed the mean functional composition by using beam sections up to 100*100 µm² for IR and 50 µm in diameter for XANES.

Results: XANES spectra reveal an increasing trend of sulfur oxidation with increasing petrological alteration degree. Highly oxidised groups (as –SO– and –SO3H) are specifically found in C1 IOMs whereas reduced groups (as –SH and –S–) are both in C1 and C2 IOMs. Reduced sulphide minerals contribution seems to decrease with increasing alteration degree as previously reported [6]. Cold Bokkeveld appears as a peculiar object showing abnormally oxidised sulfur that could be related to brecciation or heterogeneous alteration. IR spectra confirm the oxidation trend by detecting more oxygenated (carbonyl and carboxyl) groups in C1 than in C2 IOMs. Enrichment in CH2 and CH3 of CI1 toward CM suggested by IR is consistent with previous IR and NMR studies [5; 7] and cannot be attributed exclusively to oxidation processes.