NEW ANALOGS OF COMETARY NITROGEN-RICH REFRACTORY ORGANICS AND COMPARISON WITH ULTRACARBONACEOUS MICROMETEORITES

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Nitrogen-rich refractory organics are scarce phases recovered as a fraction of stratospheric IDPs and constitute the bulk of the organic matter of ultracarbonaceous Antarctic micrometeorites [1-4]. They are likely formed under very specific conditions within a nitrogen-rich environment and may provide valuable clues on the origin of the population of interplanetary dusts accreted by Earth. In this study, we aim at producing relevant analogs of such refractory organics characterized in three ultracarbonaceous Antarctic micrometeorites, starting from the carbonization of a HCN polymer and a tholin. Indeed, carbonization is a process that can increase the polyaromatic character toward a structure similar to that observed in these cosmomaterials. Both these precursors were degraded under an Ar atmosphere at 300, 500, 700 and 1000°C over ~1 hour, and characterized by elemental analyzers, micro-FTIR and Raman micro-spectroscopy (at 244 and 514 nm wavelengths excitations). Our results show that during carbonization the precursors evolve along distinct chemical and structural pathways, and that at 1000 °C the influence of the precursor structure is still very strong. Interestingly, these different carbonization routes appear in the spectral characteristics of the G and D bands of their Raman spectra. Several of the residues share chemically and structurally similarities with the three ultracarbonaceous micrometeorites recently studied [3-4] and with N-rich inclusions in stratospheric IDPs [1]. But the residues do not simultaneously account for the carbon structure (Raman) and the chemical composition (IR, N/C ratio). This points that the precursors and/or the heating conditions in our experiments are not fully relevant. Despite this lack of full relevancy, the formation of a polyaromatic structure fairly similar to that in UCAMMs and IDPs suggests an origin of N-rich refractory organics through a thermal process in the proto-solar disk, but radiolysis cannot be excluded.

References: [1] Aleon et al. 2003. Geochim. Cosmo. Acta 67: 3773:3783 [2] Floss et al. 2006 Geochim. Cosmo. Acta 70: 2371-2399 [3] Dobrica E. et al. 2011 *Met. Plan. Sci.* 46:1363-1375. [4] Dartois et al. 2013. Icarus 224:243-252.