THE JBILET WINSELWAN CARBONACEOUS CHONDRITE 1. MINERALOGY AND PETROLOGY: STRENTHENING THE LINK BETWEEN CM AND CO METEORITES?

S. S. Russell[1], A. J. King[1], P. F. Schofield[1], A. B. Verchovsky[2], F. Abernethy[2] and M. M. Grady[1,2] [1]Department of Earth Sciences, Natural History Museum, London, UK. [2]Dept. Phys. Sci, Open University, Milton Keynes, UK. E-mail: sarr@nhm.ac.uk.

Introduction: Jbilet Winselwan is a carbonaceous chondrite found in 2013 near Smara in Western Sahara. It was classified as a CM2 meteorite [1]. We have undertaken an investigation of the mineralogy and petrology of this meteorite using a sample acquired by the Natural History Museum (BM2013, M4).

Experimental: XRD patterns were obtained from a ~50 mg powdered subsample of the meteorite using an INEL X-ray diffractometer [2]. A 3 mg aliquot was then mixed with KBr and analysed by FTIR spectroscopy on beamline B22 at the Diamond Light Source, UK. Five polished sections were prepared from a single chip and analysed using a Zeiss EVO 15LS SEM.

Results: The XRD pattern contains a very broad reflection at ~19° 2θ from fine-grained/poorly crystalline phyllosilicate, and peaks from olivine, enstatite, magnetite, pyrrhotite, gypsum and anhydrite. Unlike other CM chondrites [3] no Bragg peaks from Fe-cronstedtite are observed. However, from mass balance and phase quantification analysis [2, 3] we infer the presence of a poorly crystalline Fe-bearing phase. The transmission IR spectrum shows the main phyllosilicate absorption band at ~10 μm and a strong peak at 11.2 μm from olivine.

SEM shows the meteorite has clearly defined chondrules, often with dusty rims, set in a fine grained matrix. The chondrule:matrix ratio is ~ 50:50. Most chondrules are composed of anhydrous minerals, mainly Type I (Fo_{91-99}), although several Type II chondrules are also present (Fo_{66-77}). CAIs are abundant and fairly small (<500 μm); they most closely resemble CAIs from CO meteorites [4]. At least one CAI contains abundant melilite. Metal grains are present. One of the sections contains several chondrules altered to phyllosilicate.

Discussion: Most sections of the meteorite appear to have experienced only minor aqueous processing; the presence of melilite in CAIs and metal grains in the matrix point to a lack of alteration. The IR spectrum suggests that olivine is abundant and the unusual XRD pattern could be explained if matrix oxidized iron is present as a poorly crystalline, intermediate phase in the phyllosilicate-forming reaction. However the presence of some severely aqueously altered portions in one of our sections points to it being a breccia. This may also explain differences between our observations and some of the initial reports [1]. The oxygen isotopic composition [1] and mineralogical and petrological characteristics of Jbilet Winselwan extends the range typically seen in CMs, and it joins several meteorites that bridge the gap between CO and CM meteorites, including for example Acfer 094 [5], MAC 88107, MAC 87300 [6] and Paris [7]. It is possible that the CO-CM-CI meteorites form a continuum in which chemical and isotopic differences are dictated by variations in co-accreted water, similar to the model suggested by [8].

References: [1] Meteoritical Bulletin **102** [2] Schofield et al. 2002 *Min Mag* **66** 189 [3] Howard et al. 2011 *GCA* **75** 2735 [4] Russell et al. 1998 *GCA* **62** 689 [5] Newton et al. 1995 *MAPS* **30** 46 [6] Sears et al. 1990 *LPSC* **21** 1121 [7] Hewins et al. 2014 *GCA* **124** 190 [8] Young et al. 1999 *Science* **286** 1331.