

**PONTLYFNI, THE INSIDE STORY: DISTRIBUTION OF METAL AND SULFIDE REVEALED BY MICRO-COMPUTED TOMOGRAPHY.**

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**Introduction:** Winonaites are primitive achondrites with roughly chondritic mineralogy [1]. They are related to silicate inclusions in IAB iron meteorites via their oxygen isotope compositions [2]. Pontlyfni is the only fall among the winonaites. Previous studies have shown that Pontlyfni is probably the most reduced and finest-grained of the winonaites, with textures and mineralogy that vary widely [1, 3]. In particular, Fe-Ni metal and troilite are heterogeneously distributed, with metal occurring as veins up to 6 mm in length and as particles up to 1 mm in dimension [1]. Here, we aim to elucidate the structures and abundances of the metal- and troilite-rich regions using micro-computed tomography (CT). Micro-CT is particularly suited to studying meteorites such as the winonaites, as they contain minerals with significantly different x-ray attenuation coefficients, giving rise to clearly defined variations in the greyscale values of the resultant x-ray images, and allowing easy separation of mineralogical phases.

**Method:** We scanned an ~18 g piece of Pontlyfni (BM 1975, M6), which measures 3 cm by 2 cm by 2 cm. Micro-CT scanning was carried out at the NHM using a Metris X-Tek HMXST 225 CT scanner. The specimen was scanned using a W target, at 225 kV and 175  $\mu$ A, with a 1.5 mm copper filter and 500 ms exposure at a voxel size of ~17  $\mu$ m. Data were reconstructed with a cone beam algorithm using CT-PRO. Analysis of the resulting data was carried out using VG Studio Max 2.1.

**Discussion:** In hand specimen and thin section, Pontlyfni comprises silicate material with variably weathered metal and troilite, typical of the winonaites. Our new data reveal the highly brecciated nature of this meteorite. Angular and rounded silicate clasts measuring up to 4.5 mm in dimension are distinguished from a metal- and sulfide-rich matrix. Veins of metal and sulfide also cross-cut these clasts. The CT images reveal that metal and sulfide are more abundant in Pontlyfni than previously determined. Mineral modes calculated from combined elemental maps of Pontlyfni thin sections indicate an abundance of Fe-Ni metal + troilite of 30 - 39 %, similar to published abundances of 30 - 37 % [1, 3]. By comparison, new micro-CT data show a much higher volume of metal + sulfide (51.7 %) and a lower volume of silicate phases (48.3 %). Angular, chondritic silicate inclusions have been described in some IAB irons, with an abundance of up to 40 % [4]. The combination of silicate-rich clasts set in a metal- and sulfide-rich matrix indicates that Pontlyfni more closely resembles a IAB iron meteorite, similar to some parts of Campo del Cielo or Caddo County, than a typical winonaite.

**References:** [1] Benedix, G.K. et al. 1998 *Geochimica et Cosmochimica Acta*, 62:2535-2553. [2] Clayton, R.N. and Mayeda, T.K. 1996 *Geochimica et Cosmochimica Acta*, 60: 1999-2017. [3] Floss, C. et al. 2008. *Meteoritics & Planetary Science* 43:657-674. [4] Benedix, G.K. et al. 2000 *Meteoritics & Planetary Science* 35: 1127-1141.