C2051N "Avebury"

Stardust Cratering Subgroup Foil Report. 28 June 2006

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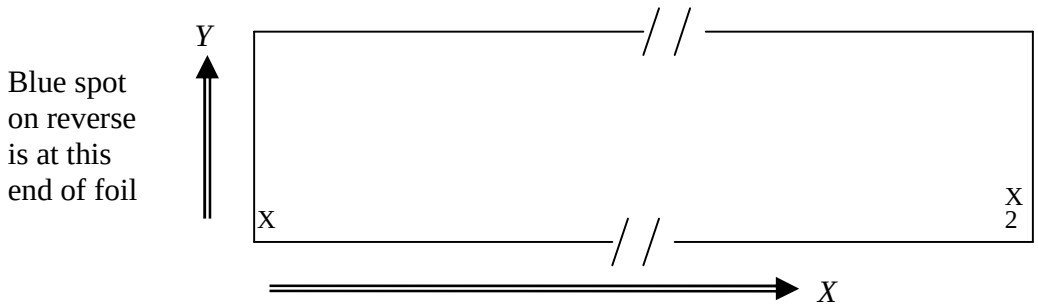
(1) General Information

General appearance: 32 x 1.5 mm.

- About 10 % is covered by grooves and damage in at least 2 orientations: near-vertical and oblique. Most damage is concentrated in a 250 μm wide band along one long edge.
- Contamination is similar to that of Bletchley. Grains of Ca-carbonate have been identified on the foil. Some of these appear to have been pressed into the foil. Other grains on the foil include traces of Na, S, Cl and Zn. Iron-rich patches are ubiquitous across the foil. In addition to this, Fe-rich grains a few microns in diameter are present within pits. These grains appear to be part of the foils which were exposed by the milling process.

Sample mounting: Held by two Sn-coated restraining wires on custom Al holder.

Foil Coordinates: Fiducial marks, size 5μm milled by ion beam in foil near corners of long side:



All measured coordinates transformed to Coordinate system (*X*,*Y*) with origin at fiducial mark 'X' and *X* axis towards fiducial mark 'X2' Units of mm.

Crater surveys:

Quanta 200D Dual Beam FIB-SEM. D_c measurement accuracy checked with etched quartz graticule.

- Manual survey mosaic images taken of entire foil (LOWRES): Secondary electrons 15 kV, 0.5 nA, x164 magnification.
  Nominal area 48 mm^2. Estimated complete to D_c = 2μm.
- Automated surveys of smaller areas (2 mm^2 and 3 mm^2). 20 kV, 0.6 nA, x1000 magnification, secondary electrons, 2048 x 1792 pixel resolution, Kalman frame (3) averaging. Working distance 7 mm. Resolution limited by flatness of foil over sub-area.
  SA1: Nominal 3 mm^2. Actual area 3.46 mm^2. Estimated complete to D_c = 1.0 μm.
  Corners (18.61, 1.33) (21.62, 1.43) (21.66, 0.29) (18.65, 0.18)
  SA2: Nominal 2 mm^2. Actual area 2.17 mm^2. Estimated complete to Dc = 1.0 μm.
  Corners (16.57, 1.18) (18.67, 1.25) (18.71, 0.22) (16.60, 0.14).

EDX measurements:

15 kV, 75 s acquisition.

C2051N “Avebury”

(2) Crater Location

LOWRES manual survey of entire foil.
Target completeness limit D_c=5μm. Estimated complete to D_c=2 μm.
Coordinates reproducible to ~0.1mm due to flexure of foil.
Randomly selected areas SA1 and SA2 to obtain completeness to D_c~1μm.
Craters that also appear in LOWRES survey are cross-referenced.

2 craters found.

LOWRES Survey

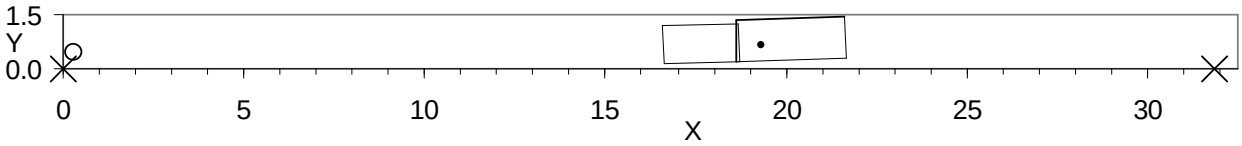
Crater	X (mm)	Y (mm)	Dc (μm)
1	0.32	0.47	6.7

SA1

Crater	X (mm)	Y (mm)	Dc (μm)
102	19.32	0.64	0.9

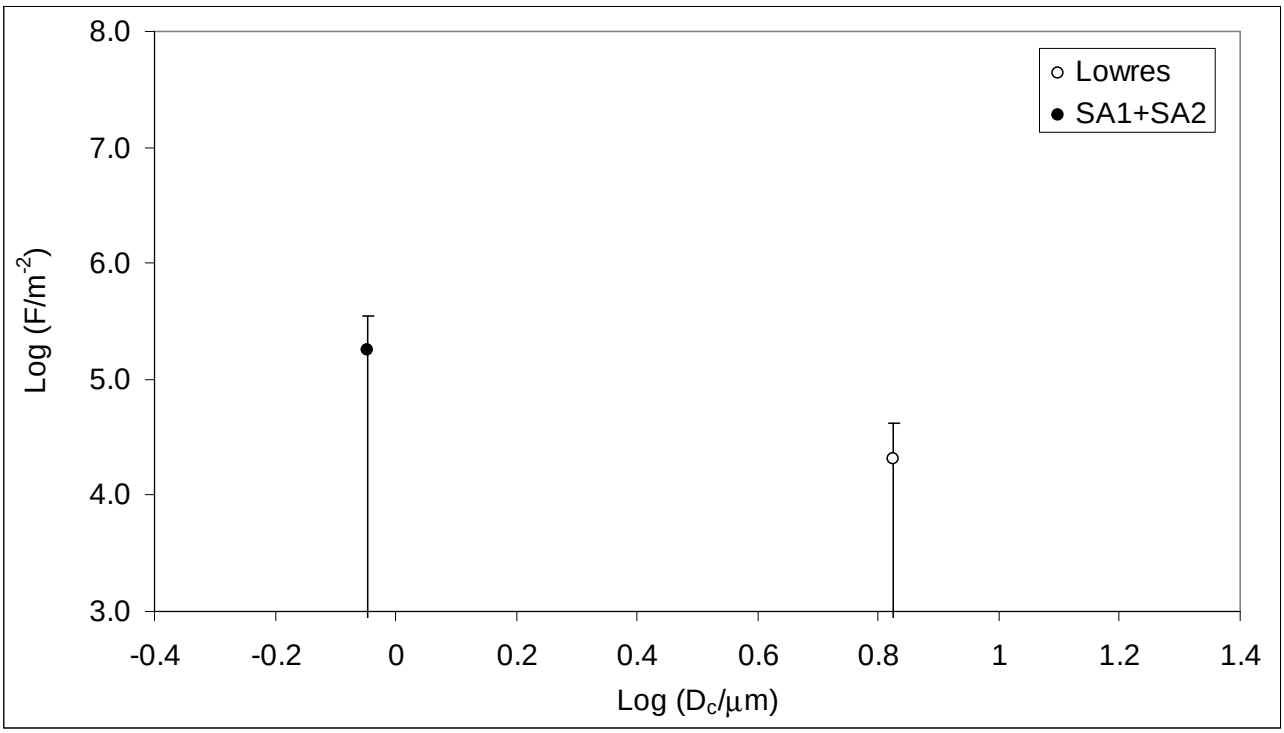
SA2

Crater	X (mm)	Y (mm)	Dc (μm)



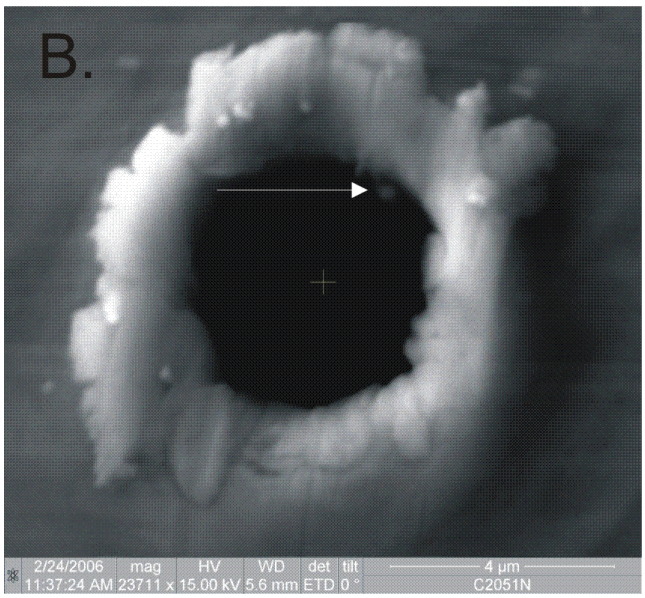
C2051N “Avebury”

(3) Size distribution



C2051N “Avebury”

(4) Images



A. Crater #1 in centre of the image. Light grains of Fe seen on the foil. Carbonate contamination is also present on the foil. Other foil damage shown arrowed. B. The ejecta on the impact crater may have been damaged by the grooving patterns on the foil. Secondary electron image. The point arrowed contains Ti, Ca, (Cl). This may be contamination. Other parts of the crater contain Mg, Si residue.

C2051N “Avebury”

(5) Composition

NB. A summary is given here. Quantitative analysis will be reported to the Min & Pet Sub-Group.

Crater	Elements detected
1	Mg, Fe, Si, Ca, Ti, Cl

The residue is heterogeneously distributed, with the arrow on the figure pointing towards the Ca-Ti-rich domain. This may be a cometary refractory phase but the presence of Cl and carbonate in the vicinity on the foil mean that contamination has not been ruled out.