HIGHER MAGNIFICATION IMAGING OF THE POLISHED ALUMINUM COLLECTOR RETURNED FROM THE GENESIS MISSION. M. C. Rodriguez[1], P. J. Burkett[2], J. H. Allton[3]; [1] Geocontrol Systems- ESCG at NASA/Johnson Space Center, Houston, TX 77058; melissa.rodriguez-1@nasa.gov, [2] Jacobs- ESCG at NASA/Johnson Space Center, Houston, TX 77058, [3] NASA/Johnson Space Center, Houston, TX 77058.

Introduction: The polished aluminum collector (previously referred to as the polished aluminum kidney) was intended for noble gas analysis for the Genesis mission. The aluminum collector, fabricated from alloy 6061T, was polished for flight with alumina, then diamond paste. Final cleaning was performed by soaking and rinsing with hexane, then isopropanol, and lastly megasonically energized ultrapure water prior to installation [1]. It was mounted inside the collector canister on the thermal shield at JSC in 2000 [2]. The polished aluminum collector was not surveyed microscopically prior to flight.

Previous and current subdivision. The collector (sample number 50684.0) has been subdivided by the use of a small handsaw in 2005 and further in 2010, resulting in 18 subsamples (Fig.1). Orientation of the cuts during subdivision of the collector was dictated by the desire to provide specific areas of flat surface for analysis by rastering techniques. The orientation was also controlled by the restrictions for securing the collector for the sawing process (attachment points). Two suspected hypervelocity impact craters (both approxomately 30 µm in diameter) were reported [3] and were specifically removed in the subdivision of 2010. Analysis of the craters is reported by [4]. To date, 36 cm^2 (14%) of the total area (245 cm^2) has been allocated for scientific study.

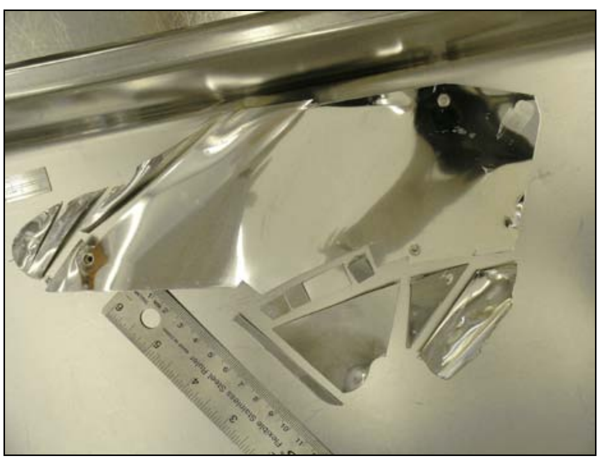

Fig. 1. Overview image of the remaining polished aluminum kidney after the most recent subdivision.

Improved imaging of the collector surface: The 2010 subdivision created more flat surface pieces and allowed better access to microscopically scan the polished surface. Collector fragments were initially scanned at 5X magnification on a Leica DM6000M microscope using either Surveyor or Image Pro Plus software. Under higher magnification, the post-landing aluminum surface is very uneven, with many bumps and undulating ridges (Fig.2a). There are also several depressions that appear as microcraters on initial examination. Portions of these "pits" have angular walls and shallow, irregular depths; excluding them from consideration as hypervelocity impact craters. Much of the contamination observed under higher magnification is consistent with what is seen on the majority of the Genesis collector array materials: 1) dark carbon fibers and fragmented array collector fines, such as silicon dust, from the spacecraft and 2) Utahogenic particulate dispersion of salts and sediments, including dried droplets (Fig.2b). Several gouges and scratches are also seen (Fig.2c). There is one feature unique to the polished aluminum surfaces: the presence of small, transparent, irregularly shaped gray film-like specks seen at 50X. They are seen on each kidney subsample and are randomly distributed across the surface (Fig. 2d).

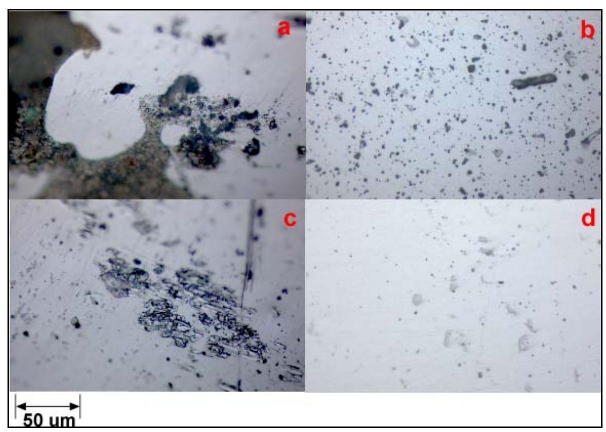

Fig. 2a-d. Examples of surface contamination on the polished aluminum pieces found at 50X magnification

Additional microcrater documentation. Additional work has been done to identify three additional microcraters in two subsamples (50684.8 and 50684.11) of the polished aluminum kidney. All of the craters have similarly shaped round, raised walls with varying pit depths (measured from collector surface to pit bottom). Crater 1 was measured to have a depth of 49 µm and outer rim dimensions of 74 µm (Fig. 3a). Crater 2 was measured to have a depth of 11 µm and outer rim dimensions of 32 µm (Fig.3b). Crater 3 was measured to have a depth of 8 µm and outer rim dimensions of 28 µm (Fig.3c).

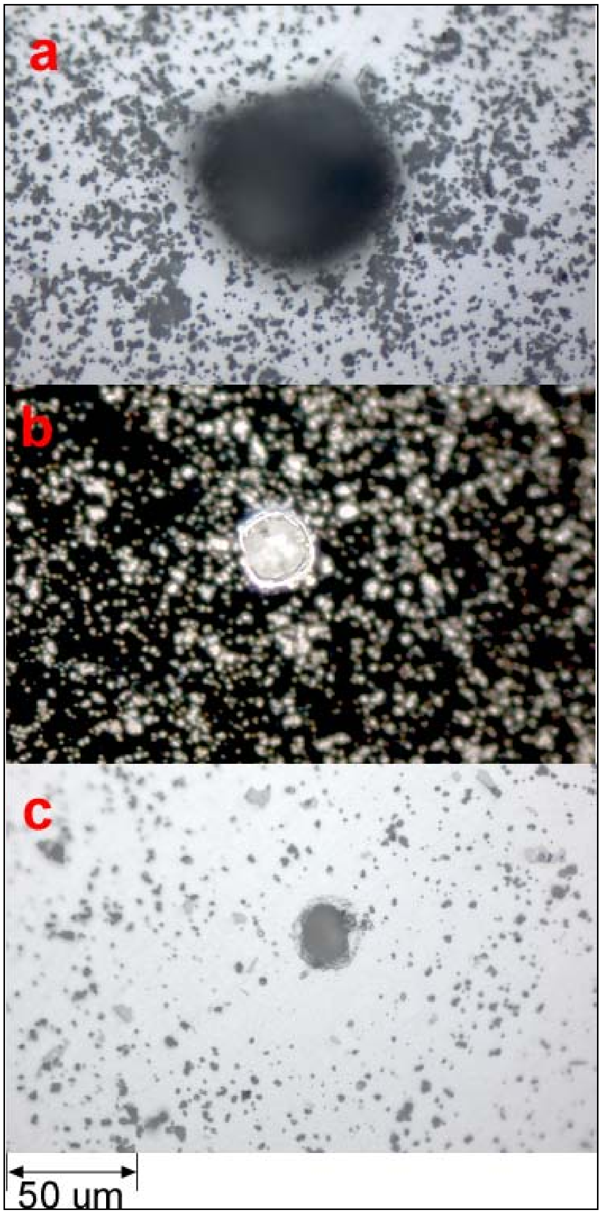

Fig.3. Microcrater features found in subsamples 50684.8 (a and b) and in 50684.11 (c).

Future work: Future work lies in assessing material in the crater depths, additional imaging, and assessment of contamination on collector array fragments having an aluminum on sapphire coating.

References: [1] Allton, J.H., et al. (2005) LPSC XXXVI, Abstract # 1806. [2] Jurewicz, A. J.G. et al. (2003) Space Science Reviews 102(1-2), 27-52. [3] Rodriguez, M.C., et al. (2008) LPSC XXXIX, Abstract # 2063. [4] Stadermann, F.J. et al. (2010) *Meteoritics & Planet Sci*., 73, A5117. [5] Love S.G. et al. (2006) Icarus, 184, 302-307.