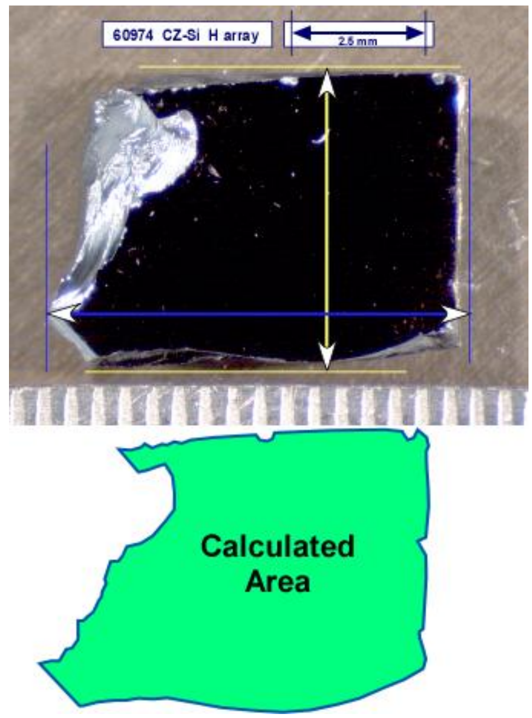
NUTS AND BOLTS - TECHNIQUES FOR GENESIS SAMPLE CURATION. P. J. Burkett[1], M.C. Rodriguez[2], J.H. Allton[3]: (1) Jacobs (ESCG) at NASA Johnson Space Center, Houston, TX; (2) Geocontrol Systems (ESCG) at NASA Johnson Space Center, Houston, TX; (3) NASA, Johnson Space Center, Houston, TX; patti.j.burkett@nasa.gov

Introduction: The Genesis curation staff at NASA Johnson Space Center provides samples and data for analysis to the scientific community, following allocation approval by the Genesis Oversight Committee, a sub-committee of CAPTEM (Curation Analysis Planning Team for Extraterrestrial Materials). We are often asked by investigators within the scientific community how we choose samples to best fit the requirements of the request. Here we will demonstrate our techniques for characterizing samples and satisfying allocation requests. Even with a systematic approach, every allocation is unique. We are also providing updated status of the cataloging and characterization of solar wind collectors as of January 2011. The collection consists of 3721 inventoried samples consisting of a single fragment, or multiple fragments containerized or pressed between post-it notes, jars or vials of various sizes.

Techniques for characteriziation and measurement of collector fragments: Data provided to investigators for sample allocation includes material type, thickness, length, width and useable or functional surface area. Measurements of the shards or fragments are not always straight forward because of surface damage or irregular shapes, but can be critical to investigators results. Step 1) After assignment of a unique number, the sample fragment is photographed with a scale bar using the Leica MZ9.5 stereomicroscope. Step 2) Array designation (BC, H, E, or L) is confirmed by measuring thickness using the Mitutoyo digimatic. Step 3) Silicon samples are speciated using FTIR (Fourier transform infrared spectroscopy), for determination of float zone versus Czochralski fabrication. Step 4) Designation of quality is given as good, fair or poor and is based on surface degradation due to crash impact damage and permanent contamination. This subjective assessment depends on material, microscope and magnification. Step 5) Using Canvas 10 software, the images are calibrated with the bar scale, measured, and labeled. Figure 1 shows length and width provided for the investigator to consider sample size relative to instrument stage size and orientation for analysis. The calculated area (shown in green) of the polished collector surface is available for analysis. However, imperfections or missing material, not touching the edge, are also included in the measurement. Step 6) Data and images are entered into the Genesis database and the Genesis public catalog to assist in investigator selection.

Figure 1. Measurement of a fragment.



Techniques for sample selection for fulfillment of allocation requests: Requests are processed after acceptance by the oversight subcommittee. Requests typically specify collector material, solar wind regime and approximate size. Step 1) The curation staff performs preliminary assessment of suitable samples from Genesis database. Investigators are encouraged to choose samples from the public catalog at: http://curator.jsc.nasa.gov/gencatalog/catalog.cfm. Step 2) We examine the available images for disqualifying features such as scratches and shape. Often only a single low magnification image is available to determine the general quality and shape. Step 3) Image sample surface using the Leica DM6000M to show details such as gouges and scratches caused by damaged during impact. Verify sample thickness optically. Step 4) Process and label the images of samples. Step 5) Communicate with investigators and provide images and characterization data for consideration. Many times a different sample is suggested. If no samples fit the requirements (which occurs more commonly for samples sized < 4 mm), a search of uncharacterized sample is conducted. Step 6) Clean Si-CZ, Si-FZ, SOS, and SAP sample with UPW, if requested. Other collector materials such as AuOS, and

DOS tend to delaminate when washed with UPW. Sample cleaning became critical after collectors were exposed to Utah soils and crash debris following the hard landing of the capsule. Cleaning removes most loose debris >5µm size and some particles down to 0.4 µm size [1]. Use megasonically energized UPW (ultrapure water) inside a wafer spinner rotating at 3000 RPM with the sample held by vacuum. Follow with UV/O_3 [2] cleaning for removal of organic films including the brown stain. Step 7) Provide results to the investigator after cleaning. Predicting cleanability is difficult, and can affect the desirability of sample for selection. Step 8) Image samples (1.25x, 10 or 20x, and 50 x magnifications) for the investigator and Genesis database. Step 9) Package samples in requested container types for shipping. Step 10) Heat seal samples twice (bag in a bag) in their container. Step 11) Document the completed allocation by verification and signature from the Genesis Curator. Step 12) Deliver samples to SCC (Sample Control Center) for shipping and tracking of packages. Because samples are expected to be received and signed for at the destination by the investigator, posting from JSC is coordinated. Step 13) Annotate in Genesis database when samples are received at destination, and when signed receipts are returned to JSC.

Unique requirements or special instructions for an allocation such as a) wrapping in prepared aluminum foil, b) shipping in special vials, c) using ellipsometry for contamination identification, or d) sample cleaving can add additional steps.

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Update of Catalog Results: Data of characterization of flown collector materials was first reported in 2009 [3], with additional samples reported here. Updated information is useful for our continuing allocations efforts. Table 1 shows 1,780 characterized samples by material, regime and 3 size classes as percentages of the total. The total measured surface area of all the characterized samples is 314,021 mm^2 as of January 2011. This represents 18.8% of the total flown array collectors.

Table 1: Collector distribution by sample area, material and array. Data as of January 2011.

MATERIAL AND REGIME	TOTAL SAMPLES	≤100 mm^2	101 - 299 mm^2	≥300 mm^2
AlOS B/C	110	20.9 %	53.6%	25.5 %
AlOS E	42	9.5 %	47.6%	42.9 %
AlOS H	69	13.0 %	46.4%	40.6 %
AlOS L	36	22.2 %	58.3%	19.4 %
AuOS B/C	98	31.6 %	44.9%	23.5 %
AuOS E	74	6.8 %	50.0%	43.2 %
AuOS H	69	13.0 %	46.4%	40.6 %
AuOS L	36	22.2 %	58.3 %	19.4 %
SOS B/C	83	28.9%	38.6 %	32.5 %
SOS E	45	8.9 %	53.3 %	37.8 %
SOS H	40	12.5 %	45.0 %	42.5 %
SOS L	38	10.5 %	57.9 %	31.6 %
SAP B/C	26	42.3 %	30.7 %	26.9 %
SAP E	35	20.0 %	37.1 %	42.9 %
SAP H	31	12.9 %	41.9 %	45.2 %
SAP L	13	30.8 %	46.1%	23.1 %
Si B/C	20	100.0 %	-	-
Si E	5	80.0%	20.0 %	-
Si H	24	58.3 %	41.7 %	-
Si L	2	100.0 %	-	-
Si-FZ B/C	138	94.9 %	5.1 %	-
Si-FZ E	49	95.9 %	4.1 %	-
Si-FZ H	50	92.0 %	8.0 %	-
Si-FZ L	37	97.3 %	2.7 %	-
Si-CZ B/C	135	97.8 %	2.2 %	-
Si-CZ E	48	87.5 %	12.5 %	-
Si-CZ H	48	89.6 %	10.4 %	-
Si-CZ L	52	92.3 %	7.7 %	-
DOS B/C	56	98.2 %	1.8 %	-
DOS E	30	100.0 %	-	-
DOS H	22	95.4 %	4.6 %	-
DOS L	19	94.7 %	5.3 %	-

References: [1] Calaway, M.J. et.al. (2007) LPSC XXXVIII, Abstract # 1627. [2] Sestak, S. et al. (2006) LPSC XXXVII, Abstract # 1878. [3] Burkett, P.J. et.al. (2009) LPSC XL, Abstract # 1373.