

The Genesis Non-flight Implant Sample Archive. C. D. Calva¹, C. P. Gonzalez², J. H. Allton³, A.J.G. Jurewicz⁴
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Introduction: For the past 20 years the Genesis science community has been analyzing solar wind captured in sample collectors now curated at Johnson Space Center (JSC). Non-flown flight like collector materials (non-flight) considered reference material was always allocated by the JSC Genesis team for testing experimental procedures. However, to expedite Genesis science, distribution of non-flown reference materials were also provided by, D. S. Burnett (Genesis PI, Caltech) and A. J. G. Jurewicz (ASU) who were funded to aid all Genesis PIs by providing engineering test materials archived at Caltech pre-flight as well as ion implants into these materials [1].

Implanted materials (non-flight reference, flight-like semiconductor materials, and NIST SRM glass) received from the Caltech collection during a pilot project are being used to develop an accession procedure for the purpose of making these materials available to researchers in the future. These implant samples are important because they can be utilized as measurement standards [2]. This is a work in progress and this work reports progress in documentation and imaging. The pilot program received 63 implanted reference materials with known implanted ions.

Genesis Non-Flight Database: The existing non-flight material database was modified to allow for the description of implant sessions and to allow correlation of the implant information to individual specimens. An implant session has three main components: a known ion, a known dose (ion/cm²), and a known energy (keV).

Procedure: Laboratory Procedure. Upon receiving non-flight analytical standards (independently calibrated implants), or implant samples (nominally calibrated implants), they will be imaged in their current containers to capture any information written before being brought into the Genesis Sample Laboratory. Documentation is provided by the donor and used for correlating the data between the implant sessions and implant samples. This information is not verified by Genesis Curation.

The microscope used to image samples in the laboratory has an automated stage with a stainless-steel plate to hold samples and a camera that utilizes the software Surveyor to take photomosaic images of the implant samples. The camera attached to the microscope is a QICAM High Performance IEEE 1394 FireWire Digital CCD Camera. This setup, shown in Fig. 1, allows for photomosaics of small-scale samples with a 10x objective or 25x objective. Examples of

images taken with this microscope setup are shown in Fig.2 and Fig. 3. After imaging, samples get stored in a clean fluoroware container or polypropylene vial depending on sample size for long term storage.

Database Procedure. The Genesis Non-Flight Database currently allows for the addition of implant sessions. The required fields for adding an implant session are the implant session ion, the implant session dose, and the implant session energy. There are also fields for the date and vendor of the sessions as well as a field for if the session was calibrated or not. Once an implant session has been inserted into the database, additional documentation from the session can be attached. The database will automatically assign an Implant Session Number.

After inserting an implant session, the implanted samples can be inserted. The fields required for an implant sample are the material of the sample and the size of the sample. The Generic name for the implant sample will be automatically generated by the database once it has been inserted. Implant sample numbers begin with 3X to distinguish from flown Genesis sample numbers. There are also fields for processors to add the location (room, cabinet, tray) and container type (fluoroware, polypropylene vial).

Once an implant session and an associated sample(s) have been inserted into the database the sample can be then tied to all associated implant sessions. An implant sample can be tied to multiple implant sessions.

Future work: For curation, future work consists of creating an online catalogue for implant samples as well as updating the database with more samples as we receive them.

For the scientific community these implant samples have many potential uses. For Genesis research, they are directly applicable for testing and, in some cases, as analytical standards. For non-Genesis research, implants (especially calibrated implants) could be used for calibrating other, unique planetary materials [1].

References: [1] Jurewicz personal communication (2022, 2024 ExMAG meeting).

[2] Burnett, D. S. et al. (2015) *Geostand Geoanal Res*, 39: 265-276.

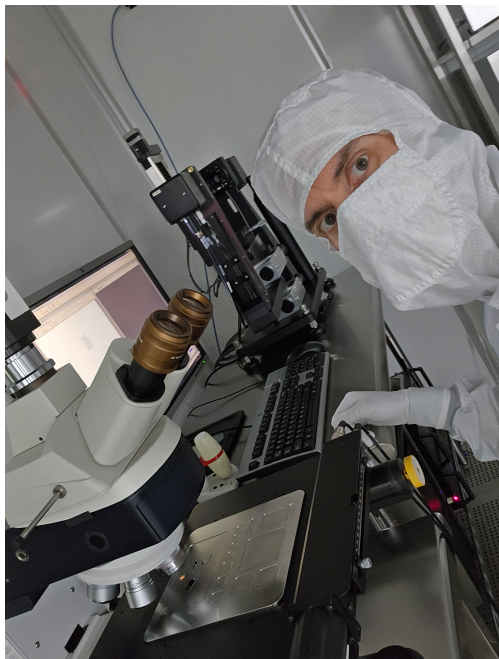


Fig. 1. Curtis in the Genesis Lab imaging Implant Samples using the Leica DM6000M microscope.

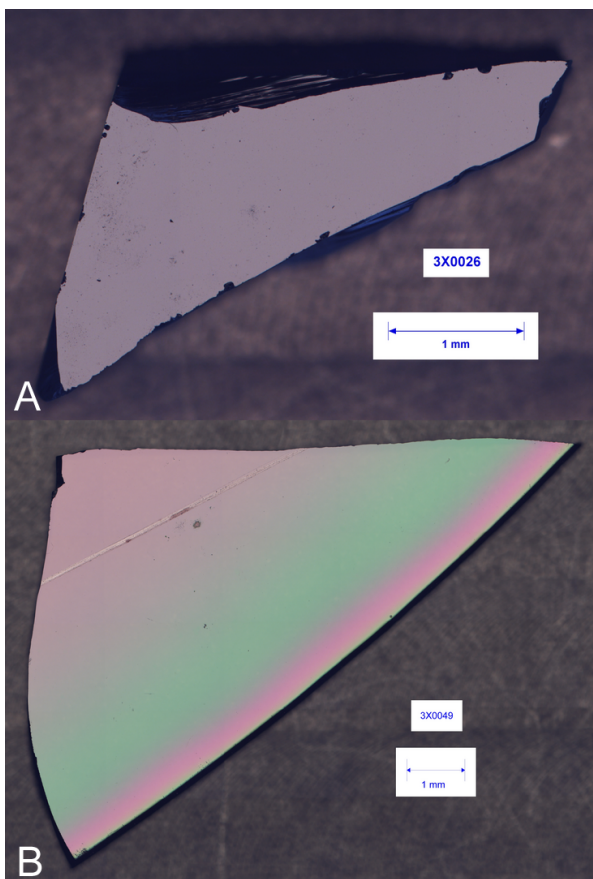


Fig. 2. A scanned mosaic of Implant Samples 3X0026 (A) and 3X0049 (B). 3X0026 is Silicon and 3X0049 is Silicon on Sapphire.