

**SPECIAL, UNOPENED LUNAR SAMPLES: IS IT TIME TO EXAMINE THEM?.** G. E. Lofgren<sup>1</sup> and J. H. Allton<sup>2</sup>, <sup>1</sup>Code KT, NASA-JSC, Houston, TX 77058, gary.e.lofgren@nasa.gov, <sup>1</sup>Code KT, NASA-JSC, Houston, TX 77058, Judith.h.allton@nasa.gov.

**Introduction:** During the last three missions to the Moon several samples were collected and immediately placed in a vacuum tight containers. Three of these samples have never been opened and, together with 2 samples not placed in vacuum, are the only lunar samples that have not been examined, Table 1. There were, however, samples collected immediately adjacent to many of these samples that have been studied. Because there was nothing notable about these samples, there was no compelling reason to open these samples, and it was decided that they be preserved for future studies. The purpose of this abstract is to remind the science community of their existence and to open a discussion as to whether this is an appropriate time to study one or more of these samples.

**Sample Description:** The vacuum samples were collected in stainless steel containers that have an indium/silver alloy seal (Fig.1). A stainless steel knife edge is pressed into indium to create the seal [1]. Two of these samples, core tubes 73001 and 69001 were placed in an additional vacuum container to help maintain the vacuum and prevent contamination. The other vacuum container, 15014, is sealed in Teflon bags. The vacuum containers that were opened immediately upon return of the samples from the Moon appeared to seal with the exception of the SESC on Apollo 16 where a SS wire that connects the lid to the can was inadvertently caught up in the seal. The unopened containers appear to be sealed based on their outward appearance. It is not anticipated that the containers still retain the level of vacuum that exists on the Moon. It is anticipated that the containers retain a more modest vacuum and that the samples have not come in contact with the terrestrial atmosphere. We will not know for sure the status of the seals until the containers are opened.

**Table 1: Unopened vacuum containers and core tubes [2]**

Sample Number	Container	Close by sample*	Amt. of sample
15014	SESC*	15030	333 g
69001	CVSC*	69940	558 g
73001	CVSC*	none	809 g
73002	in Teflon	none	429 g
70012	in Teflon	70011	434 g

\*SESC is the Special Environment Sample Container (Fig. 2). It has an indium seal to hold vacuum. The container was sealed by the astronauts on the lunar surface. CVSC is the Core Vacuum Special Container. A section of a drive tube was placed in the container on the lunar surface by the Astronauts. The container has the identical seal as the SESC. The CVSC was placed in an additional vacuum container in the curation facility. The "close by" column gives the number of sample collected immediately adjacent to the samples sealed in the SESC or CVSC containers. The "close by" samples can be considered as nearly identical to the samples sealed in vacuum.

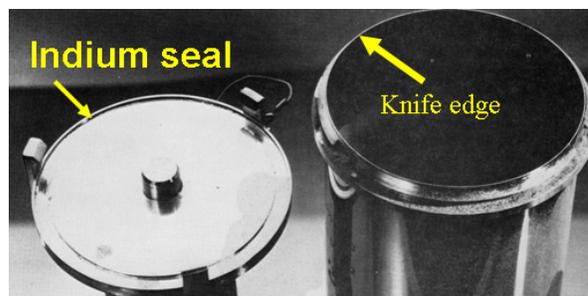


Figure 1. The seal for vacuum containers used on the Moon to contain samples in vacuum. A soft indium/silver alloy is embedded in the lid. The knife edge of the stainless steel container is forced into the seal material as the lid torqued onto the container.



Figure 2. The SESC container (Special Environment Sample Container).

In addition to reminding the community of these samples, we are soliciting ideas about how they should be handled in light of the possible studies that might be conducted. We currently do not have a vacuum facility that would allow us to open the samples in a vacuum. The vacuum processing facility in the Lunar Receiving Laboratory in which the Apollo samples were initially processed, was abandoned after Apollo 12. If it is a requirement that the samples be opened in a vacuum for future studies there are two options. Curation will need to acquire a vacuum facility or it will need to gain access to such a facility for a limited time for this purpose. If processing in our nitrogen cabinets is deemed appropriate, we can proceed with sample allocation.



Figure 3. The CVSC (Core Vacuum Sample Container).

Clearly there is value in retaining Apollo samples in as pristine a condition as possible for future studies. The new Vision for Space Exploration that includes a return to the Moon might be a reason to examine some of these preserved samples. These samples are the most pristine lunar samples that remain in the Apollo Collection. There is interest in examination of such pristine samples for a variety of engineering purposes related to the design of a lunar habitat and for lunar surface operations. There may also be important science reasons to examine some of these samples. All requests to study these samples will be evaluated by the Curation Analysis Planning Team for Extraterrestrial Materials (CAPTEM) in the manner that all request for lunar samples are evaluated.

**References:** [1] Allton J. A. (1989) JSC 23454, NASA Johnson Space Center, Houston, TX 77058. [2] Heiken G. H. et al. (1991) Lunar Sourcebook, Cambridge University Press, New York, p 328.