Storage and usage of analogue samples in an extraterrestrial sample curation facility

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Work by WP5 Analogue Samples

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Extra-terrestrial Sample Curation Facility

Basic functions:

(1) Initial inspection and characterisation of extraterrestrial materials

(2) Preparation and allocation of samples for internal and external laboratories

(3) Long-term storage

Critical steps in curating of extra-terrestrial samples

Each of the basic function requires special equipment e.g., for sample handling, manipulation, storage, analyses.

Equipment will strongly depend on the material, e.g., from Mars or asteroids.

Handling protocols and long-term storage conditions.

Analogue samples are best suited for testing equipment and handling protocols relevant for
mission hardware and curation facility.

In addition they are used to
- test and calibrate instrumentation
- help *in situ* interpretation during a mission
- undertake scientific studies

1) What types of analogue samples do we consider?

2) Why would we want to store these within the facility?

3) Which consequences has this on the facility?

1) What types of analogue samples do we consider?

Primary selection criteria were:

- terrestrial samples representing compositional and physico-technical characteristics of the expected extra-terrestrial samples **relevant for sample handling, processing and staff training in a curation facility**

So far we identified about 9 different rock types and 13 minerals.

Preliminary list of analogue samples identified

Rocky materials

Primitive basalt
Anorthosite
Dolerite
Tuff
Suevite impact breccia
Mudstone
Sulphate veins (gypsum)
Sandstone
Silica, amorphous (opal)

Minerals

Jarosite
Goethite
Hematite
Ca-carbonate
Fe carbonate
Mg carbonate
Gypsum
Anhydrite
Perchlorates
Sulphides
Mg smectites
Illite
Chlorite
Ices

Contaminants

Analogue samples identified but not yet specified:

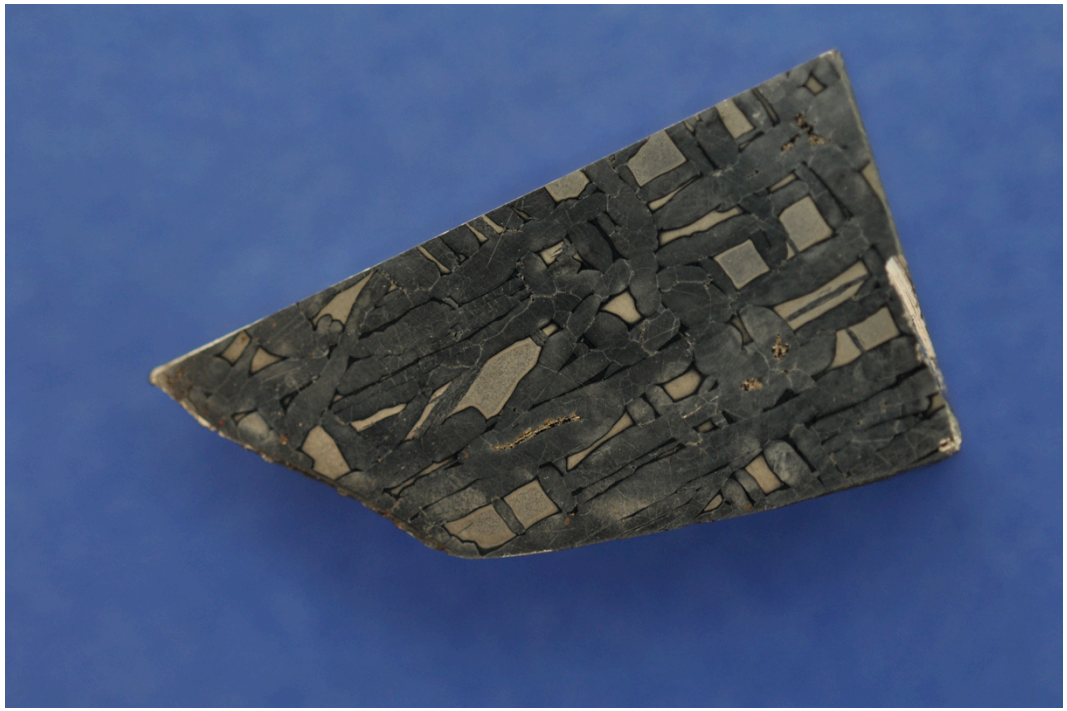
Reference samples

- Materials used in the instruments for taking and for storing samples during a mission.
- Materials potentially in contact with the samples in the curation facility.

Analogue samples

- Other materials,

e.g., chemical and biological analogues, artificial analogues of rego-lith, meteorites, etc.



2) Why would we want to store analogue samples within the facility?

Short answer is:
for practical reasons and sterility concerns.

Advantages:
- having a set of well characterised samples
- immediate and *long-term* accessibility
- monitoring effects of long-term storage
 (implying storage under similar conditions as returned samples)

3) What consequences has internal storage of analogue samples for the facility structure?

Top priority must be **avoiding contamination!**
Therefore storage areas should be kept separately from extra-terrestrial samples yet within vicinity.

Two scenarios:
1) "Test-bed situation" building a completely separated mirror facility for analogue samples only.
2) Shared curation facility.

What do we mean by “shared curation facility”?

Assumption: different areas for extra-terrestrial materials with and without restrictions for planetary protection.

“unrestricted” area

has a larger analogue sample collection. Handling and storage under the same conditions as returned samples.

What do we mean by “shared curation facility”?

“restricted” area

Keep only a very small subset of analogues in the “restricted” area.

or alternatively

Having a mirror of the restricted area for analogue samples only. Test-bed situation.

Open to discussion.