Cosmic Dust Catalog
Volume 22
Particles from Collectors U2168, W7317, W7318 and W7319
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Particles from Collectors U2168, W7317, W7318 and W7319

Compiled By:
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Introduction

Since May 1981, the National Aeronautics and Space Administration (NASA) has used aircraft to collect cosmic dust (CD) particles from Earth's stratosphere. Specially designed dust collectors are prepared for flight and processed after flight in an ultraclean (Class-100) laboratory constructed for this purpose at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas. Particles are individually retrieved from the collectors, examined and cataloged, and then made available to the scientific community for research. Cosmic dust thereby joins lunar samples and meteorites as an additional source of extraterrestrial materials for scientific study.

This catalog summarizes preliminary observations on particles retrieved from collection surfaces U2168, W7317, W7318 and W7319. These surfaces were flat plate collectors which were coated with silicone oil (dimethyl siloxane) and then flown aboard NASA ER-2 aircraft during a series of flights as follows:

<table>
<thead>
<tr>
<th>Surface</th>
<th>Flight Time and Route</th>
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<tbody>
<tr>
<td>U2168</td>
<td>36.4 hours of flight time during August 8, 2016 to October 8, 2016 over Namibia to Brazil-Oracles</td>
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<tr>
<td>W7317, W7318 &amp; W7319</td>
<td>9 hours of flight time during May 1, 2017 to August 31, 2017</td>
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All of the collectors were installed in specially constructed wing pylons which ensured that the necessary level of cleanliness was maintained between periods of active sampling. During successive periods of high altitude (20 km) cruise, the collectors were exposed in the stratosphere by barometric controls and then retracted into sealed storage containers prior to descent.

Processing of Particles

Particle mounts designed for the JEOL 100CX scanning transmission electron microscope (STEM) are currently the standard receptacles for CD particles in the JSC laboratory. Each mount consists of a graphite frame (size ~3x6x24 mm) onto which a Nucleopore filter (0.4 µm pore size) is attached. A conductive coat of carbon is vacuum evaporated onto the mount and then a microscopic reference pattern is “stenciled” onto the carbon-coated filter by vacuum evaporation of aluminum through an appropriately sized template. Particles are individually removed from collectors using glass-needle micromanipulators under a binocular stereomicroscope. Each particle is positioned on an aluminum-free area of a Freon-cleaned (Freon 113), carbon-coated filter and washed in place with hexane to remove silicone oil. Each mount is normally limited to 16 particles. All processing and storage of each particle is performed in a Class-100 clean room.
Preliminary Examination of Particles

Each rinsed particle is examined before leaving the Class-100 clean room processing area, with a petrographic research microscope equipped with transmitted, reflected and oblique light illuminators. At a magnification of 200-500X, size, shape, transparency, color, and luster are determined and recorded for each particle.

After optical description, each mount (with uncoated particles) is examined by scanning electron microscopy (SEM) and X-ray energy-dispersive spectrometry (EDS). Secondary-electron imaging of each particle was performed with an ISI SEM at an accelerating voltage of 15 kV. Images are therefore of relatively low contrast and resolution due to deliberate avoidance of conventionally applied conductive coats (carbon or gold-palladium) which might interfere with later elemental analyses of particles. EDS data are collected with the same SEM. Using an accelerating voltage of 20 kV, each particle is raster scanned and its X-ray spectrum recorded over the 0-10 keV range by counting for 30 sec. No system (artifact) peaks of significance appear in the spectra.

Catalog Format

Each page in the main body of the catalog is devoted to one particle and consists of an SEM image, an EDS spectrum, and a brief summary of preliminary examination data obtained by optical microscopy. The unique identification number assigned to the particle appears at the top of the page. Sources of the descriptive data are as follows:

Size

Size (µm) is measured using the original SEM image and its known magnification factor. For an irregularly shaped particle, the minimum dimension in the plane of the field of view is located and determined; then a second (maximum) dimension is measured at a right angle to the first. For a spherical or equidimensional particle, only a single size is recorded.

Shape

Shape is generalized to be spherical (S), equidimensional (E), or irregular (I).

Transparency

Transparency is determined by optical microscopy to be transparent (T), translucent (TL), or opaque (O). Significant variations in transparency within a particle are annotated on the SEM image.

Color

Color is determined by optical microscopy using oblique (fiber optic, quartz halogen) illumination supplemented with normal reflected (tungsten-lamp) illumination.
Luster

Luster is determined by optical microscopy using reflected normal (tungsten lamp) illumination and supplemented with oblique (fiber optic, quartz halogen) illumination. Commonly applied descriptions, adopted from mineralogical usage, include Dull (D), Metallic (M), Submetallic (SM), Subvitreous (SV), and Vitreous (V). Lusters transitional between categories or difficult to identify are indicated accordingly (Dull/Submetallic, etc.).

Type

Type indicates a provisional first order identification of each particle based on its morphology (from SEM image), elemental composition (from EDS spectrum), and optical properties. We emphasize that, for catalog purposes, types are defined for their descriptive and curatorial utility, not as scientific classifications. These tentative categorizations, which reflect judgments based on the collective experience of the CDPET, should not be construed to be firm identifications and should not dissuade any investigator from requesting any given particle for detailed study and more complete identification. The precise identification of each particle in our inventory is beyond the scope and intent of our collection and Curation program. Indeed, the reliable identification and scientific classification of cosmic dust is one of many important research tasks that we hope this catalog will stimulate. We indicate particle “TYPE” only to aid the users of this catalog (especially those new to small particle analysis) in distinguishing possible cosmic dust particles from other particles which are invariably collected during stratospheric dust sampling.

In this catalog, particles are organized according to their type. Categories used in this catalog are defined as follows:

**Cosmic (C)**

Interplanetary dust (variety unspecified) or other extraterrestrial material. In the strict sense, “Cosmic Dust” refers only to those particles which have not been modified during passage from interplanetary space to Earth’s stratosphere. In this catalog, though, particle type “Cosmic” is used to conveniently group together all particles which are judged to be of extraterrestrial origin, including those that have apparently experienced strong ablational heating or melting.

Type “Cosmic” particles are provisionally identified as those having one of the three following sets of attributes:

- a) Irregular to spherical, opaque, dark-colored particles composed mostly of Fe with minor S and/or Ni.
- b) Irregular to spherical, translucent to opaque, dark-colored particles containing various proportions of Mg, Si, and Fe with traces of S and/or Ni.
- c) Irregular to faceted or blocky, transparent to translucent particles containing mostly Mg, Si, and Fe but with traces S and/or Ni.
Category (a) and (b) particles commonly display either complex, porous aggregate-type morphologies or distinctively spherical shapes and dull to metallic lusters which distinguish them from terrestrial minerals. Their EDS spectra are reminiscent of those exhibited by meteoritic Fe-NiS minerals, or combinations of Fe-Ni-S phases with olivine and/or pyroxene. Category (c) particles display morphologies and EDS spectra which suggest that they are fragments of olivine or pyroxene crystals, neither of which are significant components of stratospheric volcanic ash. Particles which do not fall easily into categories (a), (b), or (c) but which possess some of the same attributes may be classified here as “C?” or “Possibly Cosmic.”

**Artificial Terrestrial Contamination (TCA)**

Particles included in the “TCA” category are commonly irregular in shape (though a few may be spherical) and may be transparent, translucent, or opaque. Their EDS spectra commonly show Al, Fe, or Si as the principal peaks but with a variety of minor peaks including those of Cd, Ti, V, Cr, Mn, Ni, Cu, or Zn, and at abundances that are frequently much greater than those expected in common minerals. However, such compositions are similar to those expected for certain metal alloys.

In some cases, a high intensity (relative to intensities of characteristic X-ray peaks) of continuum radiation occurs in the EDS spectrum, suggesting that low atomic number elements not detectable by the EDS (e.g., H, C, N, O) are abundant in the particle. Such “TCA” particles are tacitly inferred to by synthetic carbon based materials. (This category probably includes particles produced by or derived from aircraft operation or collector hardware, or possibly spacecraft debris. However, some of these particles are worthy of additional research and may represent true extraterrestrial “low-Z” material).

**Natural Terrestrial Contamination (TCN)**

“TCN” particles may be transparent to opaque and may exhibit a variety of colors. However, they are commonly irregular in shape and distinctively rich in Si and Al with minor abundances of Na, K, Ca, or Fe. Some Fe-S particles are classified as TCN despite the fact that they may well be extraterrestrial. This action is due to the lack of conclusive investigations regarding these particular particles. Many particles containing only low-Z elements are also classified as TCN for the same reason.

Morphologies and EDS spectra of most “TCN” particles compare favorably with respective properties of silica polymorphs, feldspar, or
silicic volcanic glass, three materials that are principal components of stratospheric volcanic ash. In addition, platy or porous aggregate-type particles of light color and Si, Al-rich composition may be silicic clay minerals, common phases in Earth's surface soils. Irregular, reddish Fe-rich particles may also be products of terrestrial rock weathering.

Recognition of these and other phases as “TCN” particles is based mostly on CDPET’s collective mineralogical experience and comparison with reference samples. Less commonly, the “TCN” category may include distinctive particles with apparently non-random shapes which are rich in low atomic number elements (as inferred from their EDS spectra having high levels of continuum x radiation and relatively small peaks for characteristic X-rays). Those rare particles are distinguished from “TCA” particles by their unusual, organized morphologies and probably represent biological contaminants.

**Aluminum or Aluminum Oxide Sphere (AOS)**

An AOS particle is transparent, subvitreous, vitreous to metallic in luster, colorless to pale yellow, and at least approximately spherical. However, shape may range from nearly perfect sphericity to pronounced ellipticity and surface texture may range from very smooth to rough. Other spheres or irregularly shaped material may be attached to its surface. Al is the distinctively dominant (or only) peak in its EDS spectrum. A sphere displaying the attributes of an AOS except with major elements in addition to Al may be listed as “AOS?” or “?”. Transparent Al rich particles of irregular shape would probably be listed as “TCA”. Most AOS particles are products of solid fuel rocket exhausts.

Again, this system for provisional classification of particles is presented only as a first order attempt to distinguish particles which are probably extraterrestrial in origin from those which are probably contaminants. All particles will require careful research examination before they can be satisfactorily identified.

**Comments**

Comments are included for particles with special features or histories. Any large “cluster” particles, which have broken apart on the collector, have small portions present in the catalog as different “sibling” grains; the comments reflect these relationships. For example, any particle with a cluster number designation in the comments field represents a much larger parent particle remaining on the collection plate, which is also available for allocation in part or in whole.
Sample Requests

Scientists desiring to perform detailed research on particles described in this catalog should apply in writing to:

Curator, Cosmic Dust Program
NASA Johnson Space Center
Code XI2
Houston, Texas 77058 U.S.A.
Telephone: (281) 483-5128
FAX: (281) 483-5347

Sample requests should refer to specific particle identification numbers and should describe the research being proposed as well as the qualifications and facilities of the investigator making the request. Publication reprints are frequently useful in sample allocation considerations. Additionally, requests for particles not yet passed through preliminary examination will be considered if the requester can demonstrate a strong need for them. NASA will arrange for a review of the scientific merits of each request and will inform the requester of the results.

Approval of a sample request does not imply or include funding for the proposed research. Questions about NASA funding should be directed to:

Discipline Scientist, Cosmochemistry Program
NASA Headquarters
Code SL
Washington, DC 20546 U.S.A.

Although foreign scientists are welcome to request samples, NASA cannot provide funds to be spent outside the U.S.A. by citizens of other countries.

Acknowledgements

The ER-2 flight personnel at NASA Dryden Research Center performed the loading and unloading of the cosmic dust collectors on the ER-2 aircraft and provided flight log data and other critical assistance.
Standard Spectra

![Graph of ALLENDE (C3) METEORITE BULK POWDER (NMNH 3529) 20 KV](image)

![Graph of DIOPSIDE JLC 99-63](image)
## Cluster Index

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<td>B1</td>
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<td>B4</td>
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<td>B5</td>
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<td>B7</td>
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<td>B8</td>
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</table>

| **W7319** |      |
| A1        | 155  |
| A2        | 158  |
| A3        | 160  |
| A4        | 163  |
| A5        | 326  |
| A6        |      |
| A7        |      |
| A8        |      |
| A9        |      |
| A10       |      |
| A11       |      |
| A12       |      |
| A13       |      |
| A14       |      |
| B1        |      |
| B2        |      |
| B3        |      |
| B4        |      |
| B5        |      |
| B6        |      |
| B7        |      |
| B8        |      |
| B9        |      |
| B10       |      |
| B11       |      |
| B12       |      |
Particle Descriptions

Cosmic and Possibly Cosmic Samples (C and C? Types)
W7317 A5

SEM Photo of sample W7317 A5 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 5

Photo of cluster W7317 Cluster 5.

Particle Size: 2-3 µm
Shape: Irregular
Transparency: Translucent
Color: AMBER, BROWN, CLEAR
Luster: Vitreous to Subvitreous
Particle Type: POSSIBLY COSMIC
Cluster No.: W7317 Cluster 5
Comments:
**W7317 A5 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-A-5 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7317-A-5 taken at test area 2. The test area is labeled in the particle SEM photo.*
W7317 A7

Particle Size: 12 µm
Shape: Equidimensional to Irregular
Transparency: Opaque to Translucent
Color: BLACK, GRAY
Luster: Pearly to Subvitreous
Particle Type: POSSIBLY COSMIC
Cluster No.: W7317 Cluster 7
Comments:

SEM Photo of sample W7317 A7 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 7

Photo of cluster W7317 Cluster 7.
**W7317 A7 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-A-7 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7317-A-7 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7317-A-7 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7317-A-7 taken at test area 4. The test area is labeled in the particle SEM photo.
**W7317 A8**

*SEM Photo of sample W7317 A8 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 8**

*Photo of cluster W7317 Cluster 8.*

**Particle Size:** 15 μm  
**Shape:** Equidimensional  
**Transparency:** Translucent to Opaque  
**Color:** BLACK, GRAY  
**Luster:** Pearly to Dull  
**Particle Type:** POSSIBLY COSMIC  
**Cluster No.:** W7317 Cluster 8  
**Comments:**
W7317 A8 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-8 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-8 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-8 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7317-A-8 taken at test area 4. The test area is labeled in the particle SEM photo.
W7317 A12

SEM Photo of sample W7317 A12 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 12

Photo of cluster W7317 Cluster 12.
**W7317 A12 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-A-12 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7317-A-12 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7317-A12 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 A13**

**SEM Photo of sample W7317 A13 with labeled EDS testing locations.**

- **Particle Size:** 23 µm
- **Shape:** Equidimensional to Irregular
- **Transparency:** Opaque
- **Color:** BLACK
- **Luster:** Pearly to Dull
- **Particle Type:** POSSIBLY COSMIC
- **Cluster No.:** W7317 Cluster 13
- **Comments:**

**Cluster of Origin: W7317 Cluster 13**

**Photo of cluster W7317 Cluster 13.**
W7317 A13 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-13 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-13 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-13 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7317-A-13 taken at test area 4. The test area is labeled in the particle SEM photo.
W7317 A14

SEM Photo of sample W7317 A14 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 14

Photo of cluster W7317 Cluster 14.

Particle Size: 8 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY COSMIC
Cluster No.: W7317 Cluster 14
Comments:
W7317 A14 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-14 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-14 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-14 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 A16**

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<tr>
<td>Color</td>
<td>BROWN, GRAY</td>
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<tr>
<td>Luster</td>
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<td>Particle Type</td>
<td>POSSIBLY COSMIC</td>
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<tr>
<td>Cluster No.</td>
<td>W7317 Cluster 16</td>
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*SEM Photo of sample W7317 A16 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 16**

*Photo of cluster W7317 Cluster 16.*
Figure 1. EDS Spectra for sample W7317-A-16 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-16 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-16 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 C2**

*SEM Photo of sample W7317 C2 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 15**

*Photo of cluster W7317 Cluster 15.*

**Particle Size:** 10 µm  
**Shape:** Irregular  
**Transparency:** Opaque to Subvitreous  
**Color:** GRAY  
**Luster:** Pearly to Dull  
**Particle Type:** POSSIBLY COSMIC  
**Cluster No.:** W7317 Cluster 15  
**Comments:**
**W7317 C2 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-2 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7317-C-2 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7317-C-2 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 C3**

Particle Size: 28 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY COSMIC
Cluster No.: Comments:

*SEM Photo of sample W7317 C3 with labeled EDS testing locations.*

**W3717 C3 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-3 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7317-C-3 taken at test area 2. The test area is labeled in the particle SEM photo.
**W7317 C4**

*SEM Photo of sample W7317 C4 with labeled EDS testing locations.*

**W7317 C4 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C4 taken at test area 1. The test area is labeled in the particle SEM photo.*

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<td>Dull</td>
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<td>Particle Type</td>
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<td>Cluster No.</td>
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<td>Comments</td>
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Figure 2. EDS Spectra for sample W7317-C-4 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7317-C-4 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 C5**

SEM Photo of sample W7317 C5 with labeled EDS testing locations.

**W7317 C5 - EDS Spectra**

*Figure 1. EDS Spectra for sample W3717-C-5 taken at test area 1. The test area is labeled in the particle SEM photo.*

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<thead>
<tr>
<th>Property</th>
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<td>Color</td>
<td>BLACK</td>
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<tr>
<td>Luster</td>
<td>Dull</td>
</tr>
<tr>
<td>Particle Type</td>
<td>POSSIBLY COSMIC</td>
</tr>
<tr>
<td>Cluster No.</td>
<td></td>
</tr>
<tr>
<td>Comments</td>
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</table>
Figure 2. EDS Spectra for sample W3717-C-5 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W3717-C-5 taken at test area 3. The test area is labeled in the particle SEM photo.
W7317 C6

**SEM Photo of sample W7317 C6 with labeled EDS testing locations.**

**W7317 C6 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-6 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7317-C-6 taken at test area 2. The test area is labeled in the particle SEM photo.
W7317 C12

**SEM Photo of sample W7317 C12 with labeled EDS testing locations.**

### W7317 C12 - EDS Spectra

**Figure 1.** EDS Spectra for sample W7317-C12 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7317-C-12 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7317-C-12 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 C14**

*SEM Photo of sample W7317 C14 with labeled EDS testing locations.*

**W7317 C14 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-14 taken at test area 1. The test area is labeled in the particle SEM photo.*

- **Particle Size:** 34x15 µm
- **Shape:** Irregular
- **Transparency:** Opaque to Translucent
- **Color:** AMBER, GRAY
- **Luster:** Pearly to Dull
- **Particle Type:** POSSIBLY COSMIC
- **Cluster No.:**
- **Comments:**
Figure 2. *EDS Spectra for sample W7317-C-14 taken at test area 2. The test area is labeled in the particle SEM photo.*

Figure 3. *EDS Spectra for sample W7317-C-14 taken at test area 3. The test area is labeled in the particle SEM photo.*
W7318 A1

**SEM Photo of sample W7318 A1 with labeled EDS testing locations.**

**Cluster of Origin: W7318 Cluster 1**

**Photo of cluster W7318 Cluster 1.**

<table>
<thead>
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<td>Color</td>
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<td>Dull</td>
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<td>Particle Type</td>
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<td>Cluster No.</td>
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<td>Comments</td>
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**W7318 A1 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-A-1 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7318-A-1 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7318-A-1 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 A2**

*SEM Photo of sample W7318 A2 with labeled EDS testing locations.*

**Cluster of Origin: W7318 Cluster 1**

*Photo of cluster W7318 Cluster 1.*
**W7318 A2 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-A-2 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7318-A-2 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7318-A-2 taken at test area 3. The test area is labeled in the particle SEM photo.
W7318 A13

SEM Photo of sample W7318 A13 with labeled EDS testing locations.

W7318 A13 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-13 taken at test area 1. The test area is labeled in the particle SEM photo.

Particle Size: 25 µm
Shape: Equidimensional to Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY COSMIC
Cluster No.: Comments:
Figure 2. EDS Spectra for sample W7318-A-13 taken at test area 2. The test area is labeled in the particle SEM photo.
W7318 A16

SEM Photo of sample W7318 A16 with labeled EDS testing locations.

W7318 A16 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-16 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-A-16 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-A-16 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 A13

**Particle Size:** 13 µm  
**Shape:** Equidimensional  
**Transparency:** Opaque  
**Color:** BROWN  
**Luster:** Dull  
**Particle Type:** POSSIBLY COSMIC  
**Cluster No.:** W7319 Cluster 7  
**Comments:**

*SEM Photo of sample W7319 A13 with labeled EDS testing locations.*

Cluster of Origin: W7319 Cluster 7

*Photo of cluster W7319 Cluster 7.*
Figure 1. EDS Spectra for sample W7319-A-13 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-13 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7319-A-13 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-13 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A14

SEM Photo of sample W7319 A14 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 7

Photo of cluster W7319 Cluster 7.

Particle Size: 23 µm
Shape: Equidimensional
Transparency: Opaque to Subvitreous
Color: BROWN, GRAY
Luster: Resinous
Particle Type: POSSIBLY COSMIC
Cluster No.: W7319 Cluster 7
Comments:
**W7319 A14 - EDS Spectra**

![Figure 1. EDS Spectra for sample W7319-A-14 taken at test area 1. The test area is labeled in the particle SEM photo.](image)

![Figure 2. EDS Spectra for sample W7319-A-14 taken at test area 2. The test area is labeled in the particle SEM photo.](image)
Figure 3. EDS Spectra for sample W7319-A-14 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 B1

Particle Size: 30 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY, RED
Luster: Dull
Particle Type: POSSIBLY COSMIC
Cluster No.: 
Comments: 

SEM Photo of sample W7319 B1 with labeled EDS testing locations.

W7319 B1 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-B-1 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7319-B-1 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-1 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7319-B-1 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A2

Sem Photo of sample U2168 A2 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 1

Photo of cluster U2168 Cluster 1.
**U2168 A2 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-2 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-2 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-2 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 B2

SEM Photo of sample U2168 B2 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 9

Photo of cluster U2168 Cluster 9.

**Particle Size:** 5x10 µm  
**Shape:** Irregular  
**Transparency:** Opaque  
**Color:** BROWN, GRAY  
**Luster:** Dull  
**Particle Type:** COSMIC  
**Cluster No.:** U2168 Cluster 9  
**Comments:**
U2168 B2 - EDS Spectra

**Figure 1.** EDS Spectra for sample U2168-B-2 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample U2168-B-2 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-B-2 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 B8**

Particle Size: 20 µm  
Shape: Equidimensional to Spherical  
Transparency: Opaque  
Color: BLACK, GRAY  
Luster: Dull  
Particle Type: COSMIC  
Cluster No.: U2168 Cluster 12  
Comments: U2168 Cluster 12

*SEM Photo of sample U2168 B8 with labeled EDS testing locations.*

*Photo of cluster U2168 Cluster 12.*
**U2168 B8 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-B-8 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-B-8 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-B-8 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-B-8 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 B11

**SEM Photo of sample U2168 B11 with labeled EDS testing locations.**

**U2168 B11 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-B-11 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-B-11 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-B-11 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-B-11 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 B12

**Particle Size:** 7 µm
**Shape:** Equidimensional
**Transparency:** Opaque
**Color:** BLACK, GRAY
**Luster:** Dull
**Particle Type:** COSMIC
**Cluster No.:**
**Comments:**

*SEM Photo of sample U2168 B12 with labeled EDS testing locations.*

**U2168 B12 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-B-12 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-B-12 taken at test area 2. The test area is labeled in the particle SEM photo.
**U2168 C4**

- **Particle Size:** 20 µm
- **Shape:** Equidimensional to Irregular
- **Transparency:** Opaque
- **Color:** BLACK
- **Luster:** Dull
- **Particle Type:** POSSIBLY COSMIC
- **Cluster No.:**
- **Comments:**

*SEM Photo of sample U2168 C4 with labeled EDS testing locations.*

**U2168 C4 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-C-4 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-C-4 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-4 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-C-4 taken at test area 4. The test area is labeled in the particle SEM photo.

Figure 5. EDS Spectra for sample U2168-C-4 taken at test area 5. The test area is labeled in the particle SEM photo.
U2168 C5

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SEM Photo of sample U2168 C5 with labeled EDS testing locations.

U2168 C5 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-5 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-5 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-5 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-C-5 taken at test area 4. The test area is labeled in the particle SEM photo.

Figure 5. EDS Spectra for sample U2168-C-5 taken at test area 5. The test area is labeled in the particle SEM photo.
**U2168 C12**

SEM Photo of sample U2168 C12 with labeled EDS testing locations.

**U2168 C12 - EDS Spectra**

Figure 1. EDS Spectra for sample U2168-C-12 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-12 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-12 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-C-12 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 C14

**SEM Photo of sample U2168 C14 with labeled EDS testing locations.**

**U2168 C14 - EDS Spectra**

![EDS Spectra](image)

**Figure 1.** EDS Spectra for sample U2168-C-14 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-14 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-14 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 C16

SEM Photo of sample U2168 C16 with labeled EDS testing locations.

U2168 C16 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-16 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-16 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-16 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D1

SEM Photo of sample U2168 D1 with labeled EDS testing locations.

<table>
<thead>
<tr>
<th>Particle Size:</th>
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<tr>
<td>Transparency:</td>
<td>Opaque</td>
</tr>
<tr>
<td>Color:</td>
<td>CLEAR, GRAY, WHITE, YELLOW</td>
</tr>
<tr>
<td>Luster:</td>
<td>Resinous to Dull</td>
</tr>
<tr>
<td>Particle Type:</td>
<td>POSSIBLY COSMIC</td>
</tr>
<tr>
<td>Cluster No.:</td>
<td></td>
</tr>
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<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. EDS Spectra for sample U2168-D-1 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-1 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-1 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 1. EDS Spectra for sample U2168-D-2 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-2 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D15

SEM Photo of sample U2168 D15 with labeled EDS testing locations.

Particle Size:  79x39 µm  
Shape:  Irregular  
Transparency:  Translucent to Opaque  
Color:  BLACK, CLEAR, GRAY, YELLOW  
Luster:  Subvitreous to Vitreous  
Particle Type:  POSSIBLY COSMIC  
Cluster No.:  
Comments:  

U2168 D15 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-15 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-15 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-15 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-D-15 taken at test area 4. The test area is labeled in the particle SEM photo.
Particle Descriptions

Artificial Terrestrial Contamination and Possibly Artificial Terrestrial Contamination (TCA and TCA ? Types)
W7317 A2

**Particle Size:** 40 µm  
**Shape:** Irregular  
**Transparency:** Transparent  
**Color:** CLEAR  
**Luster:** Vitreous  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** W7317 Cluster 2  
**Comments:**

*SEM Photo of sample W7317 A2 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 2**

*Photo of cluster W7317 Cluster 2.*
**W7317 A2 - EDS Spectra**

![EDS Spectra](image)

*Figure 1. EDS Spectra for sample W7317-A-2 taken at test area 1. The test area is labeled in the particle SEM photo.*

![EDS Spectra](image)

*Figure 2. EDS Spectra for sample W7317-A-2 taken at test area 2. The test area is labeled in the particle SEM photo.*
**W7317 A3**

*SEM Photo of sample W7317 A3 with labeled EDS testing locations.*

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<tr>
<td>Color:</td>
<td>CLEAR, GRAY</td>
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<tr>
<td>Luster:</td>
<td>Vitreous</td>
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<tr>
<td>Particle Type:</td>
<td>ARTIFICIAL TERRESTRIAL CONTAMINATION</td>
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<tr>
<td>Cluster No.:</td>
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<td>Comments:</td>
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**Cluster of Origin: W7317 Cluster 3**

*Photo of cluster W7317 Cluster 3.*
W7317 A3 - EDS Spectra

**Figure 1.** EDS Spectra for sample W7317-A-3 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample W7317-A-3 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-3 taken at test area 3. The test area is labeled in the particle SEM photo.
W7317 A4

SEM Photo of sample W7317 A4 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 4

Photo of cluster W7317 Cluster 4.
**W7317 A4 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-A-4 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7317-A-4 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7317-A-4 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7317 A9**

*SEM Photo of sample W7317 A9 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 9**

*Photo of cluster W7317 Cluster 9.*

**Particle Size:** 10 µm  
**Shape:** Equidimensional to Spherical  
**Transparency:** Opaque to Translucent  
**Color:** GRAY  
**Luster:** Vitreous  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** W7317 Cluster 9  
**Comments:**
W7317 A9 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-9 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-9 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-9 taken at test area 3. The test area is labeled in the particle SEM photo.
W7317 A17

SEM Photo of sample W7317 A17 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 17

Photo of cluster W7317 Cluster 17.

Particle Size: 11 µm
Shape: Spherical
Transparency: Translucent
Color: YELLOW
Luster: Pearly to Subvitreous
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: W7317 Cluster 17
Comments:
W7317 A17 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-17 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-17 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-17 taken at test area 3. The test area is labeled in the particle SEM photo.
### W7317 C1

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<td>GRAY</td>
</tr>
<tr>
<td><strong>Luster:</strong></td>
<td>Pearly to Dull</td>
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<td><strong>Particle Type:</strong></td>
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<tr>
<td><strong>Cluster No.:</strong></td>
<td>W7317 Cluster 15</td>
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**Comments:**

*SEM Photo of sample W7317 C1 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 15**

*Photo of cluster W7317 Cluster 15*
W7317 C1 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-C-1 taken at test area 1. The test area is labeled in the particle SEM photo.
**W7317 C7**

*SEM Photo of sample W3717 C7 with labeled EDS testing locations.*

**W7317 C7 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-7 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7317-C-7 taken at test area 2. The test area is labeled in the particle SEM photo.
**W7317 C8**

**Particle Size:**  7 µm  
**Shape:** Equidimensional  
**Transparency:** Opaque to Translucent  
**Color:** AMBER, ORANGE  
**Luster:** Pearly to Vitreous  
**Particle Type:** POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:**  
**Comments:**

*SEM Photo of sample W7317 C8 with labeled EDS testing locations.*

---

**W7317 C8 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7317-C-8 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7317-C-8 taken at test area 2. The test area is labeled in the particle SEM photo.
W7317 C9

SEM Photo of sample W7317 C9 with labeled EDS testing locations.

W7317 C9 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-C-9 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7317-C-9 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7317-C-9 taken at test area 3. The test area is labeled in the particle SEM photo.
W7317 C11

SEM Photo of sample W7317 C11 with labeled EDS testing locations.

W7317 C11 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-C-11 taken at test area 1. The test area is labeled in the particle SEM photo.

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<th>Property</th>
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<td>Color</td>
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<tr>
<td>Luster</td>
<td>Resinous</td>
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<td>Cluster No.</td>
<td></td>
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<tr>
<td>Comments</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2. EDS Spectra for sample W7317-C-11 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7317-C-11 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 A3**

SEM Photo of sample W7318 A3 with labeled EDS testing locations.

Cluster of Origin: W7318 Cluster 2

Photo of cluster W7318 Cluster 2.

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<td>Color</td>
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<tr>
<td>Luster</td>
<td>Dull</td>
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<td>Comments</td>
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**W7318 A3 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-A-3 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7318-A-3 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7318-A-3 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 A4**

*SEM Photo of sample W7318 A4 with labeled EDS testing locations.*

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<td>Cluster No.:</td>
<td>W7318 Cluster 2</td>
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<td>Comments:</td>
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**Cluster of Origin: W7318 Cluster 2**

*Photo of cluster W7318 Cluster 2.*
Figure 1. EDS Spectra for sample W7318-A-4 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7318-A-4 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7318-A-4 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 A5**

*SEM Photo of sample W7318 A5 with labeled EDS testing locations.*

---

**Cluster of Origin: W7318 Cluster 3**

*Photo of cluster W7318 Cluster 3.*
W7318 A5 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-5 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7318-A-5 taken at test area 2. The test area is labeled in the particle SEM photo.
**W7318 A6**

*SEM Photo of sample W7318 A6 with labeled EDS testing locations.*

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</tr>
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<tbody>
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<td>Transparency:</td>
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<td>Color:</td>
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<td>Particle Type:</td>
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<td>Cluster No.:</td>
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<td>Comments:</td>
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*Cluster of Origin: W7318 Cluster 3*

*Photo of cluster W7318 Cluster 3.*
**Figure 1.** EDS Spectra for sample W7318-A-6 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample W7318-A-6 taken at test area 2. The test area is labeled in the particle SEM photo.
W7318 A9

Particle Size: 20 µm  
Shape: Irregular  
Transparency: Opaque  
Color: BROWN, RED  
Luster: Dull  
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION  
Cluster No.:  
Comments:

SEM Photo of sample W7318 A9

W7318 A9 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-9 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-A-9 taken at test area 2. The test area is labeled in the particle SEM photo.
W7318 A11

SEM Photo of sample W7318 A11 with labeled EDS testing locations.

W7318 A11 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-11 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-A-11 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-A-11 taken at test area 3. The test area is labeled in the particle SEM photo.
W7318 A12

SEM Photo of sample W7318 A12 with labeled EDS testing locations.

W7318 A12 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-12 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-A-12 taken at test area 2. The test area is labeled in the particle SEM photo.
W7318 B2

SEM Photo of sample W7318 B2 with labeled EDS testing locations.

W7318 B2 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-B-2 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-B-2 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-2 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7318-B-2 taken at test area 4. The test area is labeled in the particle SEM photo.

Figure 5. EDS Spectra for sample W7318-B-2 taken at test area 5. The test area is labeled in the particle SEM photo.
**W7318 B5**

*SEM Photo of sample W7318 B5 with labeled EDS testing locations.*

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<td>Luster:</td>
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<tr>
<td>Particle Type:</td>
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**Cluster No.:**

**Comments:**

*Figure 1. EDS Spectra for sample W7318-B-5 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7318-B-5 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-5 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7318-B-5 taken at test area 4. The test area is labeled in the particle SEM photo.
W7318 B6

**SEM Photo of sample W7318 B6 with labeled EDS testing locations.**

**W7318 B6 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-B-6 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7318-B-6 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-6 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 B7**

*SEM Photo of sample W7318 B7 with labeled EDS testing locations.*

**W7318 B7 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-B-7 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7318-B-7 taken at test area 2. The test area is labeled in the particle SEM photo.
**W7318 B8**

*SEM Photo of sample W7318 B8 with labeled EDS testing locations.*

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<td>Luster</td>
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**W7318 B8 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-B-8 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7318- B-8 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318- B-8 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7319 A1**

*SEM Photo of sample W7319 A1 with labeled EDS testing locations.*

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*Cluster of Origin: W7319 Cluster 1*

*Photo of cluster W7319 Cluster 1.*
**W7319 A1 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-A-1 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7319-A-1 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-1 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-1 taken at test area 4. The test area is labeled in the particle SEM photo.
**W7319 A2**

**SEM Photo of sample W7319 A2 with labeled EDS testing locations.**

**Cluster of Origin: W7319 Cluster 1**

**Photo of cluster W7319 Cluster 1.**

**Particle Size:** 12x21 µm  
**Shape:** Irregular  
**Transparency:** Opaque  
**Color:** BLACK, GRAY  
**Luster:** Dull  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** W7319 Cluster 1  
**Comments:**
W7319 A2 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-A-2 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-2 taken at test area 2. The test area is labeled in the particle SEM photo.
W7319 A3

**SEM Photo of sample W7319 A3 with labeled EDS testing locations.**

**Cluster of Origin: W7319 Cluster 2**

**Photo of cluster W7319 Cluster 2.**

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W7319 A3 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-A-3 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-3 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7319-A-3 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 A4

SEM Photo of sample W7319 A4 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 2

Photo of cluster W7319 Cluster 2.
W7319 A4 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-A-4 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-4 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7319-A-4 taken at test area 3. The test area is labeled in the particle SEM photo.
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**Cluster of Origin: W7319 Cluster 4**

*SEM Photo of sample W7319 A7 with labeled EDS testing locations.*

*Photo of cluster W7319 Cluster 4.*
**W7319 A7 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-A-7 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7319-A-7 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-7 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7319 A8**

**SEM Photo of sample W7319 A8 with labeled EDS testing locations.**

**Cluster of Origin: W7319 Cluster 4**

**Photo of cluster W7319 Cluster 4.**
W7319 A8 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-A-8 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-8 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7319-A-8 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-8 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A9

SEM Photo of sample W7319 A9 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 5

Photo of cluster W7319 Cluster 5.

Particle Size: 8 µm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: W7319 Cluster 5
Comments:
**W7319 A9 - EDS Spectra**

![Figure 1](image1)

*Figure 1. EDS Spectra for sample W7319-A-9 taken at test area 1. The test area is labeled in the particle SEM photo.*

![Figure 2](image2)

*Figure 2. EDS Spectra for sample W7319-A-9 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-9 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-9 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A10

SEM Photo of sample W7319 A10 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 5

Photo of cluster W7319 Cluster 5.

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**W7319 A10 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-A-10 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7319-A-10 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-10 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 A11

SEM Photo of sample W7319 A11 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 6

Photo of cluster W7319 Cluster 6.
**W7319 A11 - EDS Spectra**

Figure 1. *EDS Spectra for sample W7319-A-11 taken at test area 1. The test area is labeled in the particle SEM photo.*

Figure 2. *EDS Spectra for sample W7319-A-11 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-11 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-11 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A12

SEM Photo of sample W7319 A12 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 6

Particle Size: 8 µm
Shape: Equidimensional to Spherical
Transparency: Opaque
Color: AMBER, BLACK, BROWN
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: W7319 Cluster 6
Comments:

Photo of cluster W7319 Cluster 6.
**W7319 A12 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-A-12 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample W7319-A-12 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample W7319-A-12 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-12 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 B3

SEM Photo of sample W7319 B3 with labeled EDS testing locations.

W7319 B3 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-B-3 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7319-B-3 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-3 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 B9

SEM Photo of sample W7319 B9 with labeled EDS testing locations.

W7319 B9 - EDS Spectra

**Particle Size:** 28x17 µm  
**Shape:** Irregular  
**Transparency:** Opaque to Subvitreous  
**Color:** CLEAR, GRAY  
**Luster:** Pearly  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:**  
**Comments:**

_Figure 1. EDS Spectra for sample W7319-B-9 taken at test area 1. The test area is labeled in the particle SEM photo._
Figure 2. EDS Spectra for sample W7319-B-9 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-9 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 B11

SEM Photo of sample W7319 B11 with labeled EDS testing locations.

W7319 B11 - EDS Spectra

Particle Size: 40 µm
Shape: Spherical to Equidimensional
Transparency: Translucent
Color: AMBER, YELLOW
Luster: Resinous to Subvitreous
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments: 

Figure 1. EDS Spectra for sample W7319-B-11 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7319-B-11 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-11 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7319-B-11 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 B12

SEM Photo of sample W7319 B12 with labeled EDS testing locations.

**W7319 B12 - EDS Spectra**

![EDS Spectra](image)

*Figure 1. EDS Spectra for sample W7319-B-12 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7319-B-12 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-12 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7319-B-12 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A1

Particle Size: 10 µm
Shape: Irregular
Transparency: Opaque
Color: AMBER, BROWN
Luster: Pearly to Vitreous
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 1
Comments:

SEM Photo of sample U2168 A1 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 1

Photo of cluster U2168 Cluster 1.
**U2168 A1 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-1 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-1 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-1 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-1 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A5

SEM Photo of sample U2168 A5 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 3

Photo of cluster U2168 Cluster 3.

Particle Size: 15 µm
Shape: Irregular to Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 3
Comments:
Figure 1. EDS Spectra for sample U2168-A-5 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-A-5 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-5 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-5 taken at test area 4. The test area is labeled in the particle SEM photo.
Figure 5. EDS Spectra for sample U2168-A-5 taken at test area 5. The test area is labeled in the particle SEM photo.

Figure 6. EDS Spectra for sample U2168-A-5 taken at test area 6. The test area is labeled in the particle SEM photo.
U2168 A6

SEM Photo of sample U2168 A6 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 3

Photo of cluster U2168 Cluster 3.
**U2168 A6 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-6 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-6 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-6 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-6 taken at test area 4. The test area is labeled in the particle SEM photo.
### U2168 A9

**SEM Photo of sample U2168 A9 with labeled EDS testing locations.**

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**Cluster of Origin: U2168 Cluster 5**

**Photo of cluster U2168 Cluster 5.**
U2168 A9 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-A-9 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-A-9 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-9 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-9 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A10

SEM Photo of sample U2168 A10 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 5

Photo of cluster U2168 Cluster 5.
U2168 A10 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-A-10 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-A-10 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-10 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 A12

Cluster of Origin: U2168 Cluster 6

SEM Photo of sample U2168 A12 with labeled EDS testing locations.

Cluster No.: U2168 Cluster 6

Comments:

Particle Size: 33x20 µm
Shape: Irregular
Transparency: Opaque
Color: GRAY
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION

Photo of cluster U2168 Cluster 6.
**U2168 A12 - EDS Spectra**

**Figure 1.** EDS Spectra for sample U2168-A-12 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample U2168-A-12 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-12 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 B3**

*SEM Photo of sample U2168 B3 with labeled EDS testing locations.*

---

**Cluster of Origin: U2168 Cluster 10**

*Photo of cluster U2168 Cluster 10.*
**U2168 B3 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-B-3 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-B-3 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-B-3 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 B4

Cluster of Origin: U2168 Cluster 10

SEM Photo of sample U2168 B4 with labeled EDS testing locations.

Cluster No.: U2168 Cluster 10

Comments:

Particle Size: 20x33 µm
Shape: Equidimensional to Irregular
Transparency: Opaque
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION

Photo of cluster U2168 Cluster 10.
**U2168 B4 - EDS Spectra**

**Figure 1.** EDS Spectra for sample U2168-B-4 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample U2168-B-4 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 B5

SEM Photo of sample U2168 B5 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 11

Photo of cluster U2168 Cluster 11.
Figure 1. EDS Spectra for sample U2168-B-5 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-B-5 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-B-5 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 B6**

*SEM Photo of sample U2168 B6 with labeled EDS testing locations.*

**Cluster of Origin: U2168 Cluster 11**

*Photo of cluster U2168 Cluster 11.*

- **Particle Size:** 18 µm
- **Shape:** Equidimensional to Irregular
- **Transparency:** Opaque to Translucent
- **Color:** GRAY
- **Luster:** Subvitreous to Dull
- **Particle Type:** TERRESTRIAL CONTAMINATION (ARTIFICIAL/POSSIBLY NATURAL ?)
- **Cluster No.:** U2168 Cluster 11
- **Comments:**
**U2168 B6 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-B-6 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-B-6 taken at test area 2. The test area is labeled in the particle SEM photo.*
U2168 B9

Particle Size: 30 µm
Shape: Irregular
Transparency: Opaque to Translucent
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample U2168 B9 with labeled EDS testing locations.

U2168 B9 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-B-9 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-B-9 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-B-9 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-B-9 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 B10

**Particle Size:** 14x6 µm  
**Shape:** Irregular  
**Transparency:** Opaque  
**Color:** BLACK  
**Luster:** Dull  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION

*SEM Photo of sample U2168 B10 with labeled EDS testing locations.*

U2168 B10 - EDS Spectra

*Figure 1. EDS Spectra for sample U2168-B-10 taken at test area 1. The test area is labeled in the particle SEM photo.*

**full scale counts:** 2227  
B10\(\{2\}_{ptl}\)
Figure 2. EDS Spectra for sample U2168-B-10 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-B-10 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 B13

SEM Photo of sample U2168 B13 with labeled EDS testing locations.

U2168 B13 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-B-13 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-B-13 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-B-13 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 B14

Particle Size: 45 µm
Shape: Equidimensional to Irregular
Transparency: Opaque to Translucent
Color: BLACK, CLEAR, GRAY
Luster: Metallic to Vitreous
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample U2168 B14 with labeled EDS testing locations.

U2168 B14 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-B-14 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-B-14 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 C1

**SEM Photo of sample U168 C1 with labeled EDS testing locations.**

**U2168 C1 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-C-1 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-C-1 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-1 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-C-1 taken at test area 4. The test area is labeled in the particle SEM photo.
**U2168 C2**

**SEM Photo of sample U2168 C2 with labeled EDS testing locations.**

**U2168 C2 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-C-2 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-C-2 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-2 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 C3

SEM Photo of sample U2168 C3 with labeled EDS testing locations.

U2168 C3 - EDS Spectra

Particle Size: 23 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION

Cluster No.: 
Comments:

Figure 1. EDS Spectra for sample U2168-C-3 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-3 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-3 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-C-3 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 C6

SEM Photo of sample U2168 C6 with labeled EDS testing locations.

U2168 C6 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-6 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-6 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-6 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 C7

SEM Photo of sample U2168 C7 with labeled EDS testing locations.

Particle Size: 18 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

Figure 1. EDS Spectra for sample U2168-C-7 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-7 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-7 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 C11

SEM Photo of sample U2168 C11

Particle Size: 24 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

U2168 C11 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-11 taken at test area 1. The test area is labeled in the particle SEM photo.
U2168 C13

SEM Photo of sample U2168 C13 with labeled EDS testing locations.

U2168 C13 - EDS Spectra

Particle Size: 30 µm
Shape: Irregular to Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

Figure 1. EDS Spectra for sample U2168-C-13 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-13 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 C15

SEM Photo of sample U2168 C15 with labeled EDS testing locations.

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U2168 C15 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-15 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-15 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-15 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D3

SEM Photo of sample U2168 D3 with labeled EDS testing locations.

U2168 D3 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-3 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-3 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D6

SEM Photo of sample U2168 D6 with labeled EDS testing locations.

U2168 D6 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-6 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-6 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D7

Particle Size: 19 µm
Shape: Irregular
Transparency: Opaque
Color: GRAY
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION

Cluster No.: 
Comments:

SEM Photo of sample U2168 D7 with labeled EDS testing locations.

U2168 D7 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-7 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-7 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D8

Particle Size: 30x15 µm
Shape: Irregular
Transparency: Translucent to Opaque
Color: CLEAR, GRAY
Luster: Pearly to Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample U2168 D8 with labeled EDS testing locations.

U2168 D8 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-8 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-8 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D9

SEM Photo of sample U2168 D9 with labeled EDS testing locations.

U2168 D9 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-9 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-9 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D11

SEM Photo of sample U2168 D11 with labeled EDS testing locations.

**U2168 D11 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-D-11 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-D-11 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 D13

SEM Photo of sample U2168 D13 with labeled EDS testing locations.

U2168 D13 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-13 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-13 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-13 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D16

SEM Photo of sample U2168 D16 with labeled EDS testing locations.

U2168 D16 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-16 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-16 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-16 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 E1

**Particle Size:** 12 µm  
**Shape:** Equidimensional  
**Transparency:** Transparent to Translucent  
**Color:** CLEAR  
**Luster:** Vitreous to Subvitreous  
**Particle Type:** POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** U2168 Cluster 13  
**Comments:**

*SEM Photo of sample U2168 E1 with labeled EDS testing locations.*

*Cluster of Origin: U2168 Cluster 13*

*Photo of cluster U2168 Cluster 13.*
**U2168 E1 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E-1 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-E-1 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-E-1 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 E3**

**Particle Size:** 13x30 µm  
**Shape:** Irregular  
**Transparency:** Opaque  
**Color:** BLACK  
**Luster:** Dull  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** U2168 Cluster 14  
**Comments:**

*SEM Photo of sample U2168 E3 with labeled EDS testing locations.*

**Cluster of Origin: U2168 Cluster 14**

*Photo of cluster U2168 Cluster 14.*
**U2168 E3 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E-3 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-E-3 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-E-3 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 E4

Particle Size: 20x10 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 14
Comments:

SEM Photo of sample U2168 E4 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 14

Photo of cluster U2168 Cluster 14.
U2168 E4 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-E-4 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-4 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-E-4 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 E5

Particle Size: 27 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 15
Comments:

SEM Photo of sample U2168 E5 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 15

Photo of cluster U2168 Cluster 15.
U2168 E5 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-E-5 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-5 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-E-5 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-E-5 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 E6

SEM Photo of sample U2168 E6 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 15

Photo of cluster U2168 Cluster 15.
Figure 1. EDS Spectra for sample U2168-E-6 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-6 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-E-6 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-E-6 taken at test area 4. The test area is labeled in the particle SEM photo.
**U2168 E7**

*SEM Photo of sample U2168 E7 with labeled EDS testing locations.*

**Cluster of Origin: U2168 Cluster 16**

*Photo of cluster U2168 Cluster 16.*

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**U2168 E7 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E-7 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-E-7 taken at test area 2. The test area is labeled in the particle SEM photo.*
U2168 E8

Particle Size: 13 µm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 16
Comments:

Cluster of Origin: U2168 Cluster 16
U2168 E8 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-E-8 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-8 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 E9

SEM Photo of sample U2168 E9 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 17

Photo of cluster U2168 Cluster 17.

Particle Size: 30 µm
Shape: Equidimensional to Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 17
Comments:
U2168 E9 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-E-9 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-9 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-E-9 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 E10**

*SEM Photo of sample U2168 E10 with labeled EDS testing locations.*

**Cluster of Origin: U2168 Cluster 17**

*Photo of cluster U2168 Cluster 17.*

- **Particle Size:** 20 µm
- **Shape:** Equidimensional to Irregular
- **Transparency:** Opaque
- **Color:** BLACK
- **Luster:** Dull
- **Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION
- **Cluster No.:** U2168 Cluster 17
- **Comments:**

---

*U2168 E10* is a sample from the Cosmic Dust Catalog, Volume 22. The sample is characterized by its particle size of 20 µm, with an equidimensional to irregular shape, opaque transparency, black color, and dull luster. It is classified as an artificial terrestrial contamination. The cluster of origin is identified as U2168 Cluster 17.
**U2168 E10 - EDS Spectra**

Figure 1. EDS Spectra for sample U2168-E-10 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-10 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-E-10 taken at test area 3. The test area is labeled in the particle SEM photo.
## U2168 E11

**Particle Size:** 10 µm  
**Shape:** Equidimensional  
**Transparency:** Opaque  
**Color:** BLACK  
**Luster:** Dull  
**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** U2168 Cluster 18  
**Comments:**

*SEM Photo of sample U2168 E11 with labeled EDS testing locations.*

### Cluster of Origin: U2168 Cluster 18

*Photo of cluster U2168 Cluster 18.*
**U2168 E11 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E11 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-E11 taken at test area 2. The test area is labeled in the particle SEM photo.*
U2168 E12

SEM Photo of sample U2168 E12 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 18

Photo of cluster U2168 Cluster 18.
**U2168 E12 - EDS Spectra**

Figure 1. EDS Spectra for sample U2168-E-12 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-E-12 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 E14

SEM Photo of sample U2168 E14 with labeled EDS testing locations.

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Figure 1. EDS Spectra for sample U2168-E-14 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-E-14 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-E-14 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 E15

*SEM Photo of sample U2168 E15 with labeled EDS testing locations.*

**U2168 E15 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E-15 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-E-15 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-E-15 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-E-15 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 E16

*SEM Photo of sample U2168 E16 with labeled EDS testing locations.*

**Particle Size:** 25 µm

**Shape:** Irregular

**Transparency:** Opaque

**Color:** BLACK

**Luster:** Dull

**Particle Type:** ARTIFICIAL TERRESTRIAL CONTAMINATION

**Cluster No.:**

**Comments:**

**U2168 E16 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-E-16 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-E-16 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-E-16 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-E-16 taken at test area 4. The test area is labeled in the particle SEM photo.

Figure 5. EDS Spectra for sample U2168-E-16 taken at test area 5. The test area is labeled in the particle SEM photo.
Particle Descriptions

Natural Terrestrial Contamination and Possibly Natural Terrestrial Contamination (TCN and TCN Types)
SEM Photo of sample W7317 A1 with labeled EDS testing locations.

Cluster of Origin: W7317 Cluster 1

Photo of cluster W7317 Cluster 1.
W7317 A1 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-A-1 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-1 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-1 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7317-A-1 taken at test area 4. The test area is labeled in the particle SEM photo.
**W7317 A10**

*SEM Photo of sample W7317 A10 with labeled EDS testing locations.*

**Cluster of Origin: W7317 Cluster 10**

*Photo of cluster W7317 Cluster 10.*

**Particle Size:** 22 µm  
**Shape:** Equidimensional to Irregular  
**Transparency:** Opaque  
**Color:** BLACK, GRAY  
**Luster:** Pearly to Dull  
**Particle Type:** NATURAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** W7317 Cluster 10  
**Comments:**
Figure 1. EDS Spectra for sample W7317-A-10 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-10 taken at test area 2. The test area is labeled in the particle SEM photo.
**W7317 A11**

*SEM Photo of sample W7317 A11 with labeled EDS testing locations.*

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*Cluster of Origin: W7317 Cluster 11*

*Photo of cluster W7317 Cluster 11.*
Figure 1. EDS Spectra for sample W7317-A-11 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7317-A-11 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7317-A-11 taken at test area 3. The test area is labeled in the particle SEM photo.
W7317 C10

Particle Size: 6 µm
Shape: Equidimensional to Spherical
Transparency: Opaque to Translucent
Color: GRAY, YELLOW
Luster: Resinous
Particle Type: POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample W7317 C10 with labeled EDS testing locations.

W7317 C10 - EDS Spectra

Figure 1. EDS Spectra for sample W7317-C-10 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7317-C-10 taken at test area 2. The test area is labeled in the particle SEM photo.
W7318 A14

SEM Photo of sample W7318 A14 with labeled EDS testing locations.

W7318 A14 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-14 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-A-14 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-A-14 taken at test area 3. The test area is labeled in the particle SEM photo.
W7318 A15

Particle Size: 20 µm
Shape: Equidimensional to Irregular
Transparency: Opaque
Color: BROWN
Luster: Dull
Particle Type: POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample W7318 A15 with labeled EDS testing locations.

W7318 A15 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-A-15 taken at test area 1. The test area is labeled in the particle SEM photo.
**Figure 2.** EDS Spectra for sample W7318-A-15 taken at test area 2. The test area is labeled in the particle SEM photo.

**Figure 3.** EDS Spectra for sample W7318-A-15 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7318-A-15 taken at test area 4. The test area is labeled in the particle SEM photo.
W7318 B1

SEM Photo of sample W7318 B1 with labeled EDS testing locations.

W7318 B1 - EDS Spectra

Figure 1. EDS Spectra for sample W7318-B-1 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-B-1 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-1 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7318 B3**

*SEM Photo of sample W7318 B3.*

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**Cluster No.:**

**Comments:**

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**W7318 B3 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7318-B-3 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7318-B-3 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-3 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7318-B-3 taken at test area 4. The test area is labeled in the particle SEM photo.
W7318 B4

SEM Photo of sample W7318 B4 with labeled EDS testing locations.

**W7318 B4 - EDS Spectra**

Figure 1. EDS Spectra for sample W7318-B-4 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7318-B-4 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7318-B-4 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W731B-4 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A5

Particle Size: 13 μm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: W7319 Cluster 3
Comments:

SEM Photo of sample W7319 A5 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 3

Photo of cluster W7319 Cluster 3.
Figure 1. EDS Spectra for sample W7319-A-5 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample W7319-A-5 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample W7319-A-5 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample W7319-A-5 taken at test area 4. The test area is labeled in the particle SEM photo.
W7319 A6

SEM Photo of sample W7319 A6 with labeled EDS testing locations.

Cluster of Origin: W7319 Cluster 3

Photo of cluster W7319 Cluster 3.

**Particle Size:** 14 μm

**Shape:** Irregular

**Transparency:** Opaque

**Color:** CLEAR

**Luster:** Subvitreous

**Particle Type:** NATURAL TERRESTRIAL CONTAMINATION

**Cluster No.:** W7319 Cluster 3

**Comments:**
**W7319 A6 - EDS Spectra**

![Figure 1. EDS Spectra for sample W7319-A-6 taken at test area 1. The test area is labeled in the particle SEM photo.](image)

![Figure 2. EDS Spectra for sample W7319-A-6 taken at test area 2. The test area is labeled in the particle SEM photo.](image)
Figure 3. EDS Spectra for sample W7319-A-6 taken at test area 3. The test area is labeled in the particle SEM photo.
W7319 B2

Particle Size: 48 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample W7319 B2 with labeled EDS testing locations.

W7319 B2 - EDS Spectra

Figure 1. EDS Spectra for sample W7319-B-2 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample W7319-B-2 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-2 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample W7319-B-2 taken at test area 4. The test area is labeled in the particle SEM photo.
**W7319 B5**

*SEM Photo of sample W7319 B5 with labeled EDS testing locations.*

**W7319 B5 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-B-5 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7319-B-5 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample W7319-B-5 taken at test area 3. The test area is labeled in the particle SEM photo.
**W7319 B7**

*SEM Photo of sample W7319 B7*

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**W7319 B7 - EDS Spectra**

*Figure 1. EDS Spectra for sample W7319-B-7 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample W7319-B-7 taken at test area 2. The test area is labeled in the particle SEM photo.
U2168 A3

SEM Photo of sample U2168 A3 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 2

Photo of cluster U2168 Cluster 2.
**U2168 A3 - EDS Spectra**

**Figure 1.** EDS Spectra for sample U2168-A-3 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample U2168-A-3 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-3 taken at test area 3. The test area is labeled in the particle SEM photo.
**U2168 A4**

*SEM Photo of sample U2168 A4 with labeled EDS testing locations.*

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<tr>
<td>Cluster No.</td>
<td>U2168 Cluster 2</td>
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*Cluster of Origin: U2168 Cluster 2*

*Photo of cluster U2168 Cluster 2.*
**U2168 A4 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-4 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-4 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-4 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-4 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A7

SEM Photo of sample U2168 A7 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 4

Photo of cluster U2168 Cluster 4.

**Particle Size:** 12 µm  
**Shape:** Equidimensional to Irregular  
**Transparency:** Opaque  
**Color:** BLACK  
**Luster:** Dull  
**Particle Type:** POSSIBLY NATURAL TERRESTRIAL CONTAMINATION  
**Cluster No.:** U2168 Cluster 4  
**Comments:**
U2168 A7 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-A-7 taken at test area 1. The test area is labeled in the particle SEM photo.

Figure 2. EDS Spectra for sample U2168-A-7 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-7 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-7 taken at test area 4. The test area is labeled in the particle SEM photo.
**U2168 A8**

**Particle Size:** 16 µm  
**Shape:** Irregular  
**Transparency:** Opaque  
**Color:** BLACK  
**Luster:** Dull  
**Particle Type:** NATURAL, TERRESTRIAL, CONTAMINATION  
**Cluster No.:** U2168 Cluster 4  
**Comments:**

*SEM Photo of sample U2168 A8 with labeled EDS testing locations.*

**Cluster of Origin: U2168 Cluster 4**

*Photo of cluster U2168 Cluster 4.*
**U2168 A8 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-8 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-8 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-8 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-8 taken at test area 4. The test area is labeled in the particle SEM photo.
Figure 5. EDS Spectra for sample U2168-A-8 taken at test area 5. The test area is labeled in the particle SEM photo.

Figure 6. EDS Spectra for sample U2168-A-8 taken at test area 6. The test area is labeled in the particle SEM photo.
U2168 A13

SEM Photo of sample U2168 A13 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 7

Photo of cluster U2168 Cluster 7.
**U2168 A13 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-13 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-13 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-13 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-13 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A14

Particle Size: 23 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 7
Comments:

SEM Photo of sample U2168 A14 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 7

Photo of cluster U2168 Cluster 7.
**U2168 A14 - EDS Spectra**

**Figure 1.** EDS Spectra for sample U2168-A-14 taken at test area 1. The test area is labeled in the particle SEM photo.

**Figure 2.** EDS Spectra for sample U2168-A-14 taken at test area 2. The test area is labeled in the particle SEM photo.
Figure 3. EDS Spectra for sample U2168-A-14 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-14 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 A15

Particle Size: 32 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: U2168 Cluster 8
Comments:

SEM Photo of sample U2168 A15 with labeled EDS testing locations.

Cluster of Origin: U2168 Cluster 8

Photo of cluster U2168 Cluster 8.
**U2168 A15 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-A-15 taken at test area 1. The test area is labeled in the particle SEM photo.*

*Figure 2. EDS Spectra for sample U2168-A-15 taken at test area 2. The test area is labeled in the particle SEM photo.*
Figure 3. EDS Spectra for sample U2168-A-15 taken at test area 3. The test area is labeled in the particle SEM photo.

Figure 4. EDS Spectra for sample U2168-A-15 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 C9

SEM Photo of sample U2168 C9 with labeled EDS testing locations.

U2168 C9 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-9 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-9 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-9 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 C10

Particle Size: 24 μm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Dull
Particle Type: POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.: 
Comments:

SEM Photo of sample U2168 C10 with labeled EDS testing locations.

U2168 C10 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-C-10 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-C-10 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-C-10 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D4

SEM Photo of sample U2168 D4 with labeled EDS testing locations.

**U2168 D4 - EDS Spectra**

*Figure 1. EDS Spectra for sample U2168-D-4 taken at test area 1. The test area is labeled in the particle SEM photo.*
Figure 2. EDS Spectra for sample U2168-D-4 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-4 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D5

SEM Photo of sample U2168 D5 with labeled EDS testing locations.

U2168 D5 - EDS Spectra

Particle Size: 30 µm
Shape: Irregular
Transparency: Translucent
Color: CLEAR, GRAY
Luster: Pearly to Subvitreous
Particle Type: NATURAL TERRESTRIAL CONTAMINATION

Cluster No.: Comments:

Figure 1. EDS Spectra for sample U2168-D-5 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-5 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-5 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 D12

SEM Photo of sample U2168 D12 with labeled EDS testing locations.

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U2168 D12 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-12 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-12 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-12 taken at test area 3. The test area is labeled in the particle SEM photo.
Figure 4. EDS Spectra for sample U2168-D-12 taken at test area 4. The test area is labeled in the particle SEM photo.
U2168 D14

SEM Photo of sample U2168 D14 with labeled EDS testing locations.

U2168 D14 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-D-14 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-D-14 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-D-14 taken at test area 3. The test area is labeled in the particle SEM photo.
U2168 E13

SEM Photo of sample U2168 E13 with labeled EDS testing locations.

U2168 E13 - EDS Spectra

Figure 1. EDS Spectra for sample U2168-E-13 taken at test area 1. The test area is labeled in the particle SEM photo.
Figure 2. EDS Spectra for sample U2168-E-13 taken at test area 2. The test area is labeled in the particle SEM photo.

Figure 3. EDS Spectra for sample U2168-E-13 taken at test area 3. The test area is labeled in the particle SEM photo.