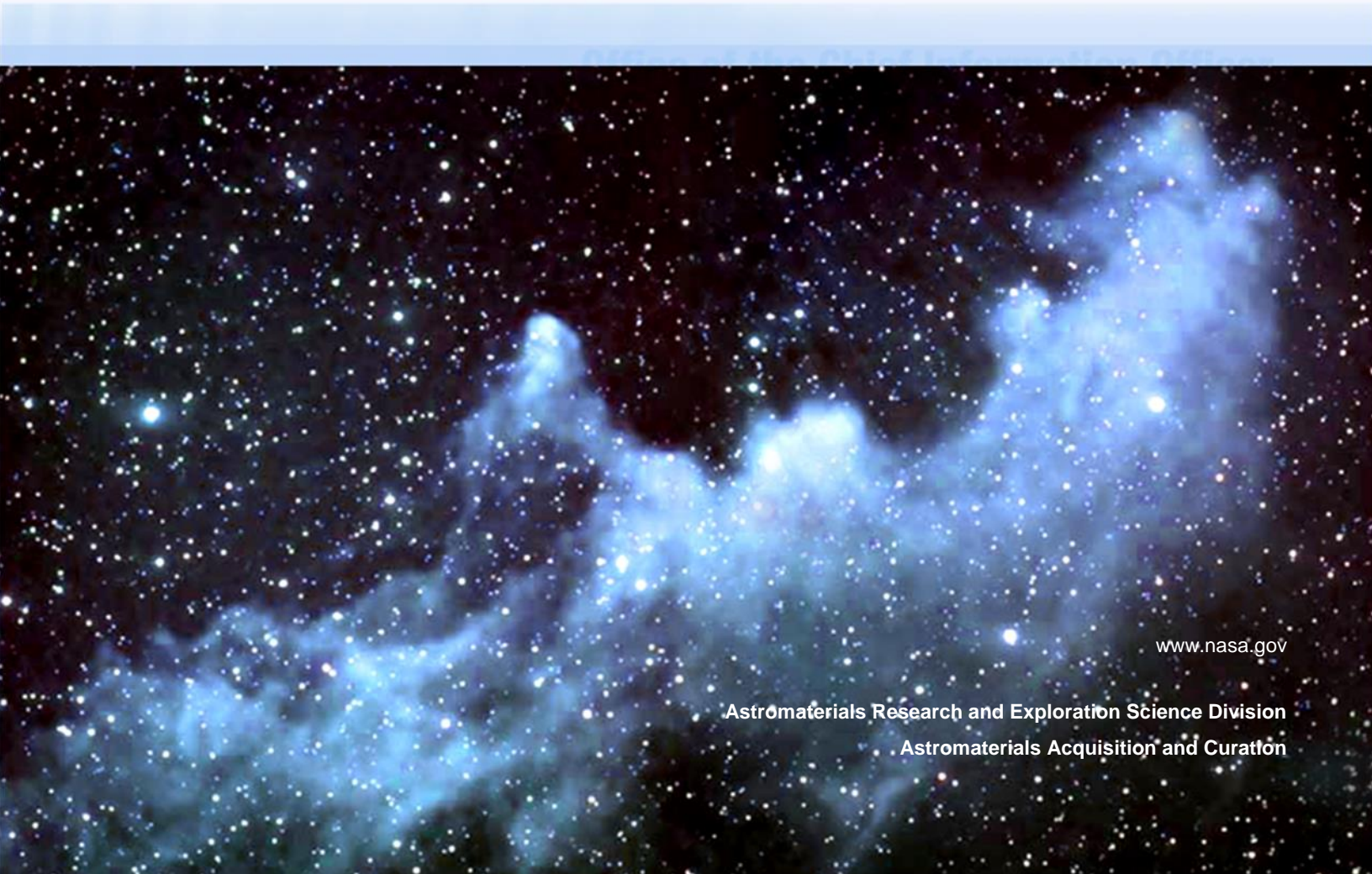




Cosmic Dust Catalog Volume 23

Particles from Collectors U2170, U2172 and W7016



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Astromaterials Research and Exploration Science Division
Astromaterials Acquisition and Curator

Cosmic Dust Catalog

Volume 23

Particles from Collectors U2170 and U2172

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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 U2170, U2172 and W7016. 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:

U2170	Transit from Georgia to Recife, Brazil. Transit from Brazil to Namibia. First science flight off west coast of Africa-RTB early due to coolant pump problem. 53.92 hours Flight start 8/9/2019 to 9/22/2016
U2172	Perseid meteor shower. August 20, 2018. Flight path over the ocean from appx. Monterey to @400 miles off the coast of Washington and back. Open 18:37Z, Closed 22:51Z. Flight time a little over 4 hours. Wing tip 1, ER2
W7016	Flight from 5/1/1981 to 7/1/1981, 65.5 hrs of exposure time. A light background of ash was noted on the collector surface. WB57

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 stereo-microscope. 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 be 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 X12
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

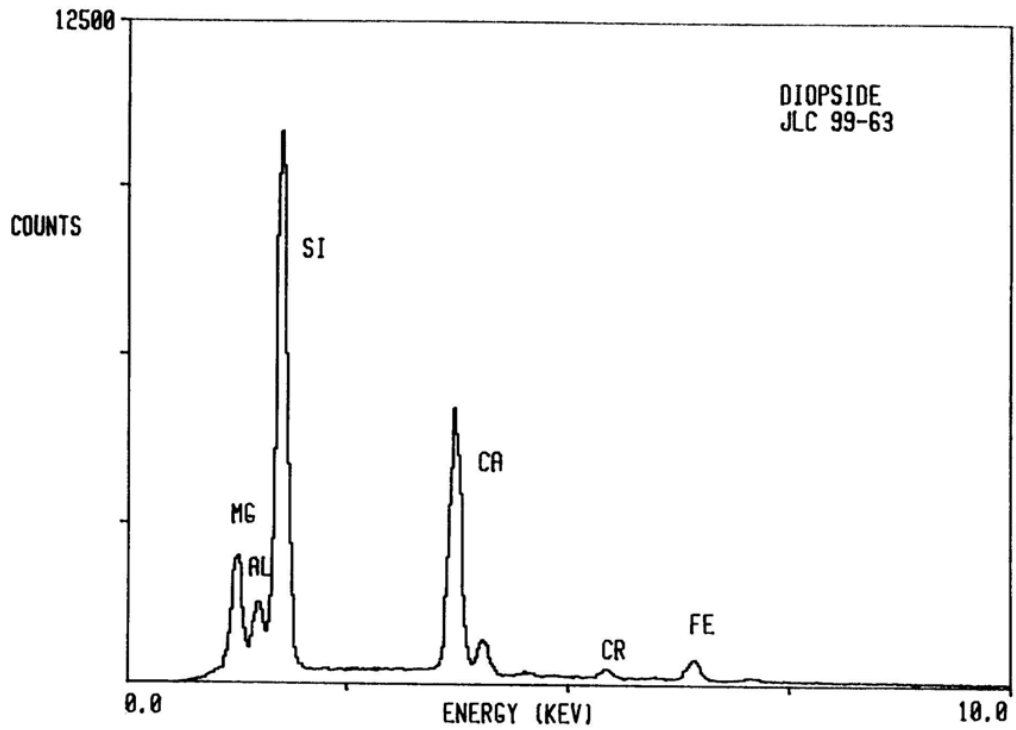
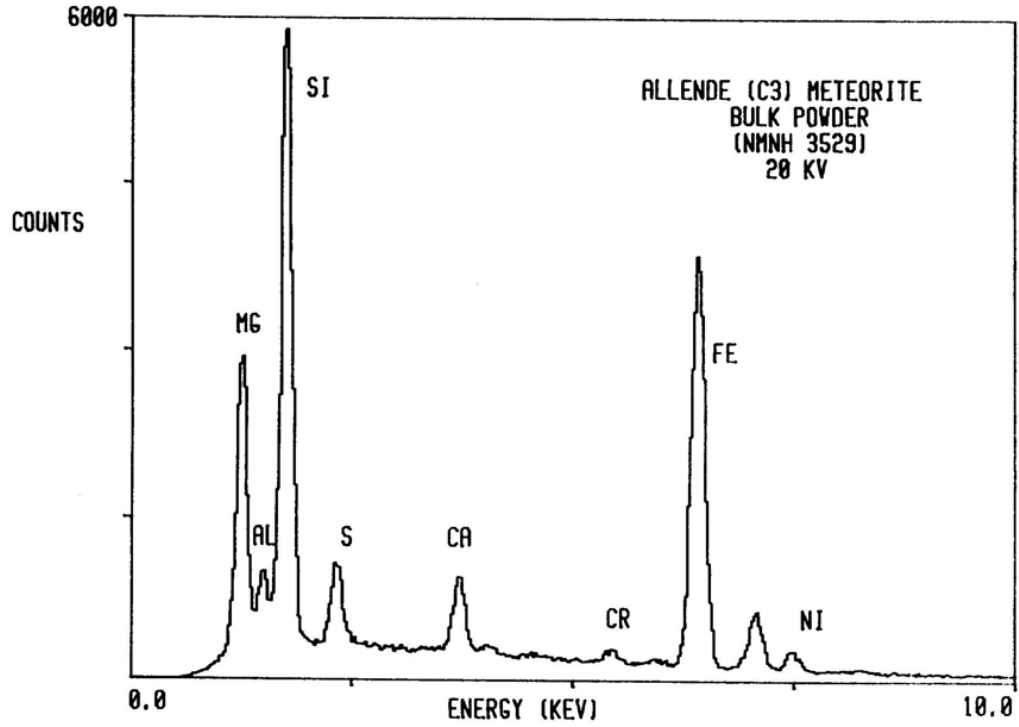
NASA Headquarters
Code SL
Washington, DC 20546 U.S.A.

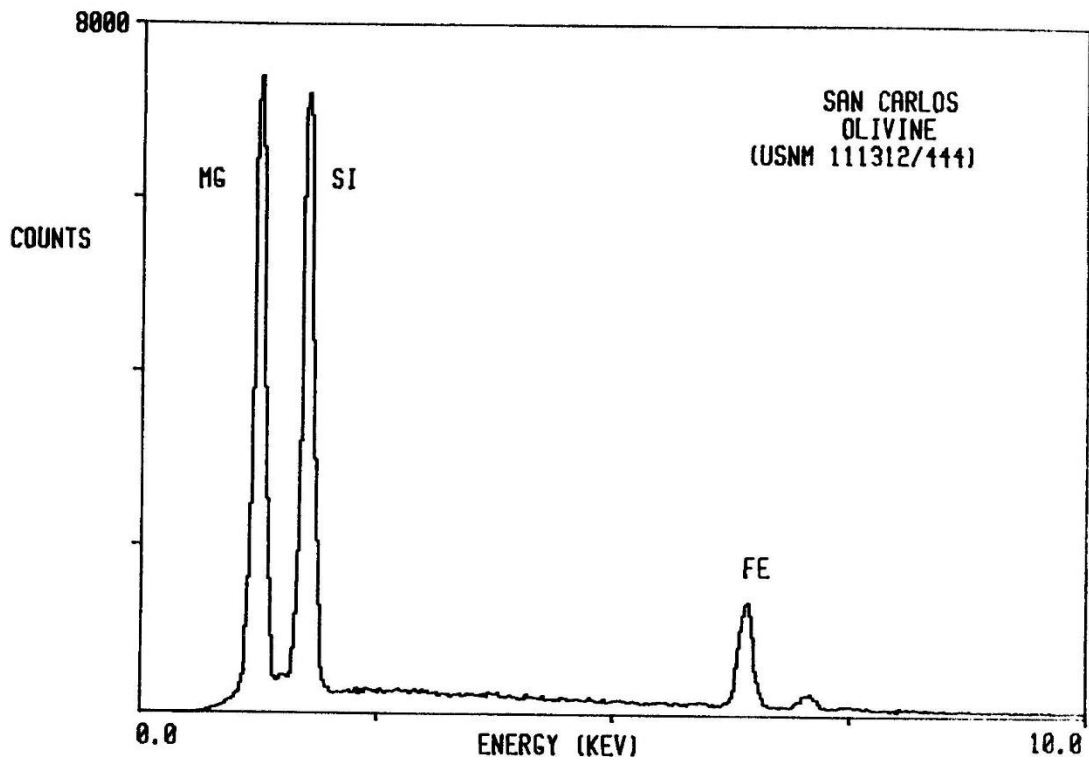
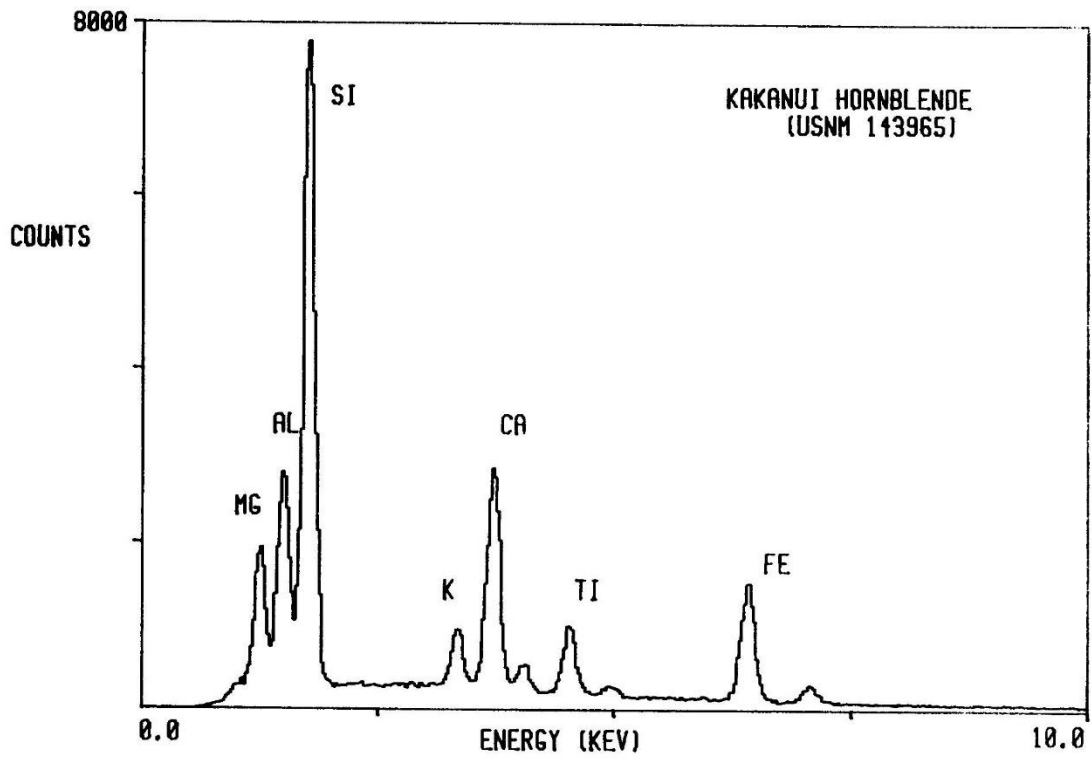
Although foreign scientists are welcome to request samples, NASA cannot provide funds to be spent outside the U.S.A. by citizens of other countries.

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





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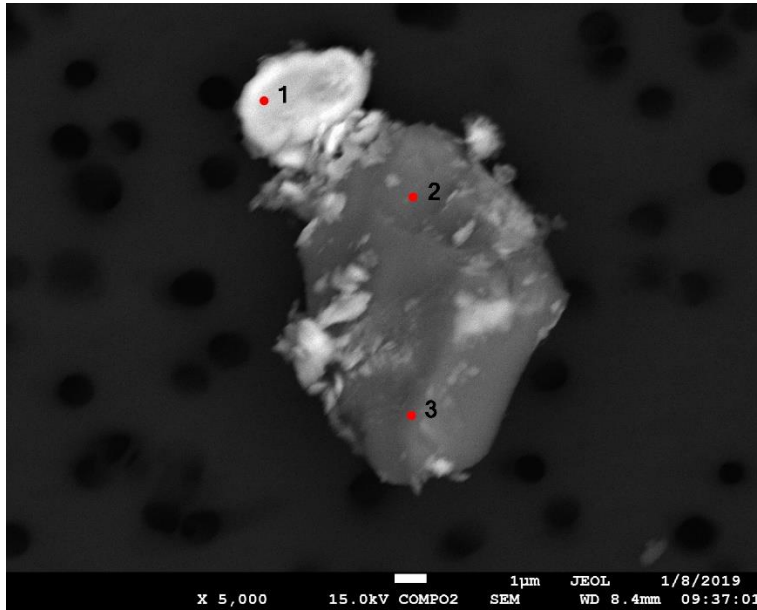
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Particle Descriptions

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

U2170 A1



Particle Size:	7 µm
Shape:	Equidimensional to Irregular
Transparency:	Translucent to Opaque
Color:	GRAY
Luster:	Resinous to Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	U2170 Cluster 1
Comments:	

SEM photo of sample U2170-A1 with labeled EDS testing locations..

Cluster of Origin: U2170 Cluster 1

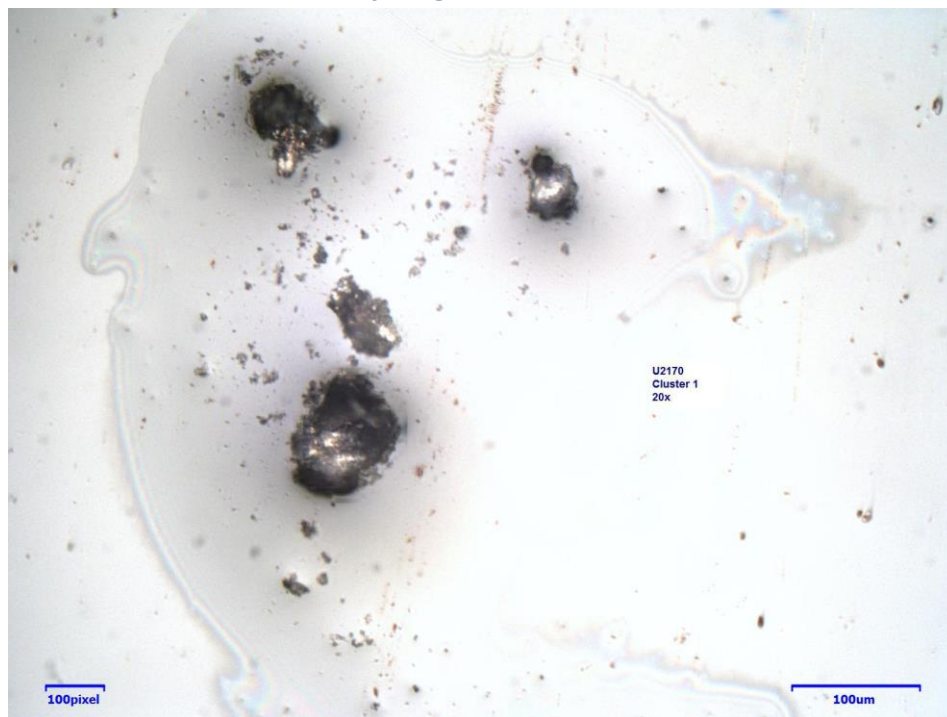


Photo of cluster U2170 Cluster 1.

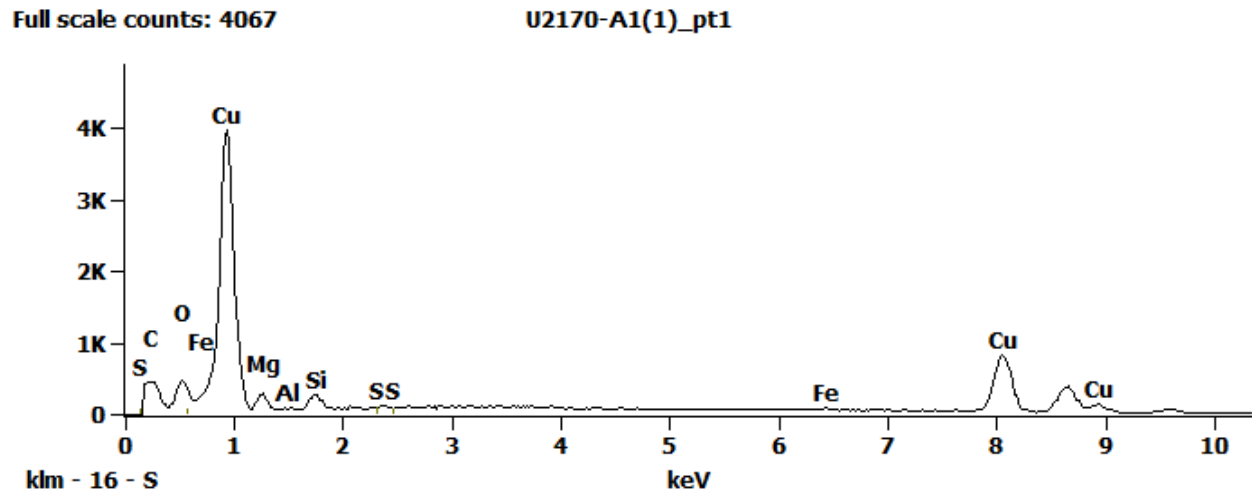
U2170 A1 - EDS Spectra

Figure 1. EDS spectra for sample U2170-A1 taken at test area 1. The test area is labeled in the particle SEM photo.

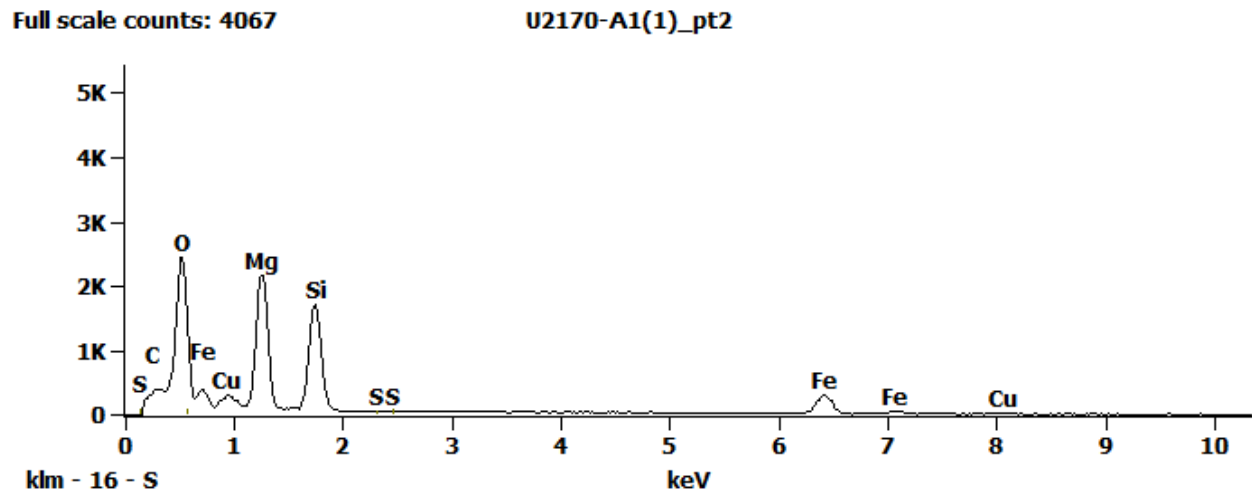


Figure 2. EDS spectra for sample U2170-A1 taken at test area 2. The test area is labeled in the particle SEM photo.

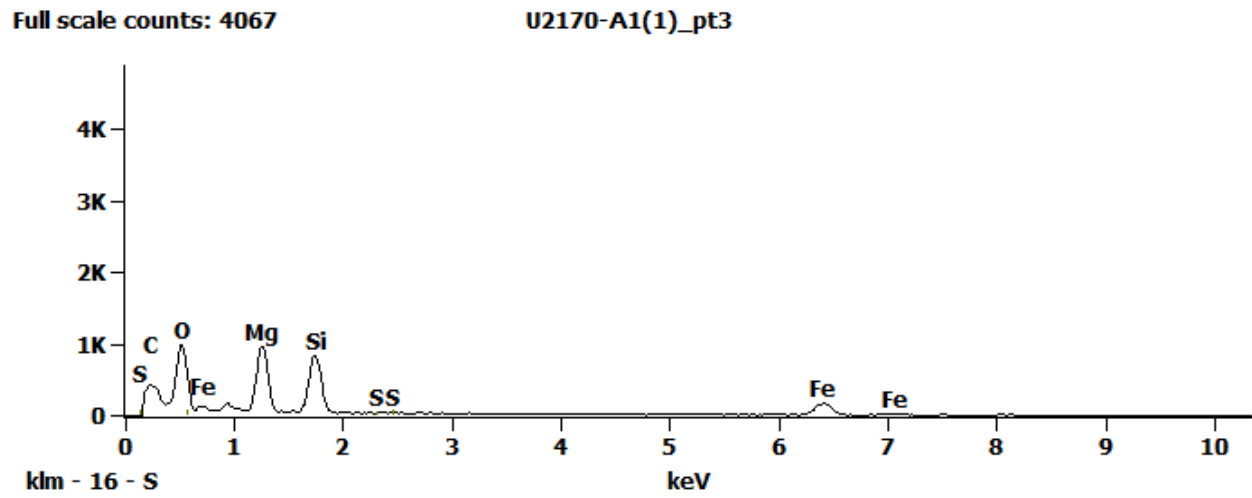
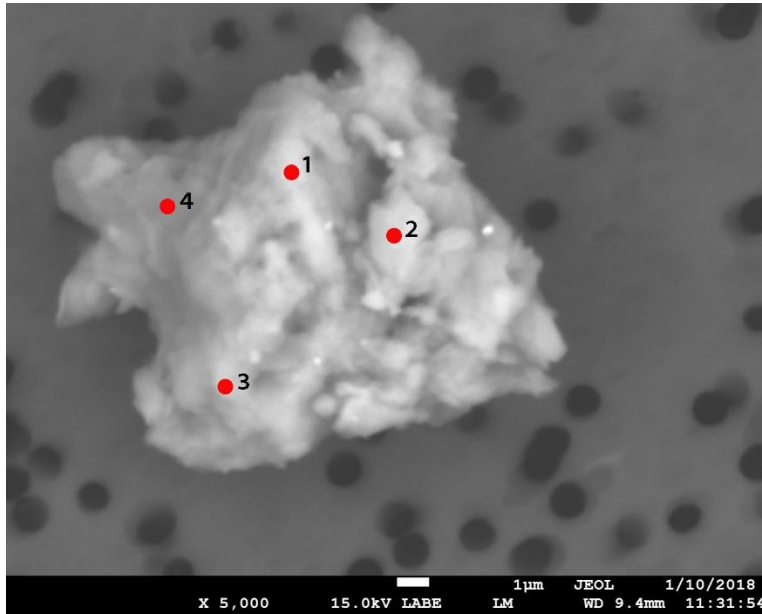


Figure 3. EDS spectra for sample U2170-A1 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A14



Particle Size:	12 µm
Shape:	Equidimensional
Transparency:	Translucent to Opaque
Color:	GRAY
Luster:	Pearly to Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	U2170 Cluster 7
Comments:	

SEM photo of sample U2170-A14 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 7

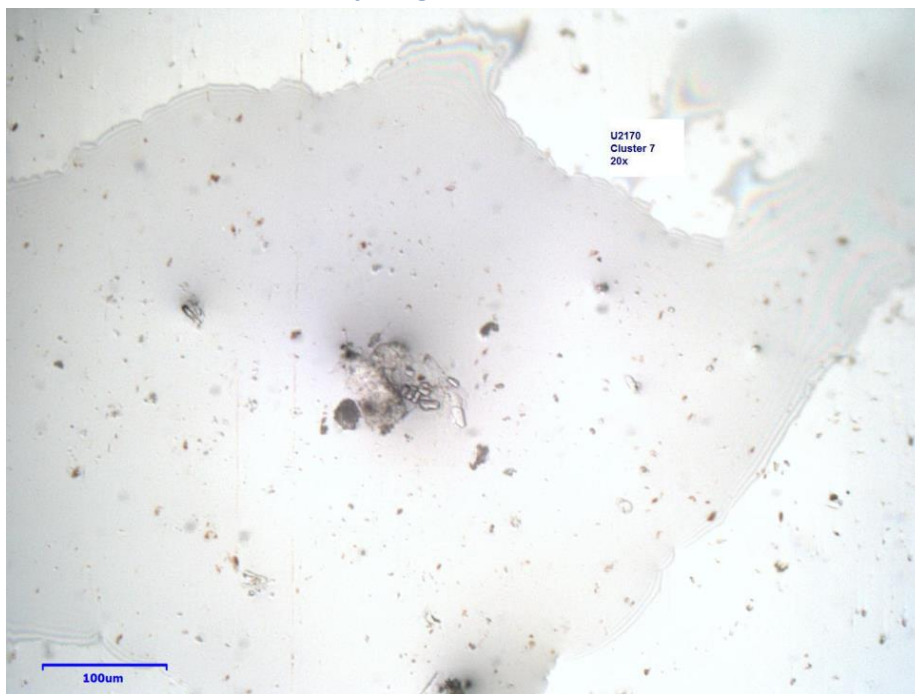


Photo of cluster U2170 Cluster 7.

U2170 A14 - EDS Spectra

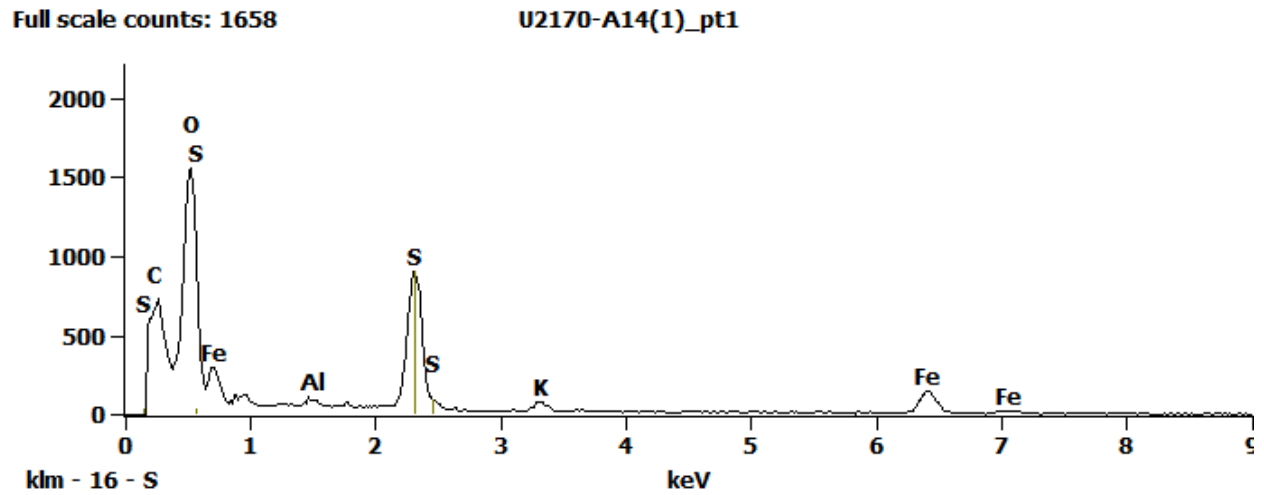


Figure 1. EDS spectra for sample U2170-A14 taken at test area 1. The test area is labeled in the particle SEM photo.

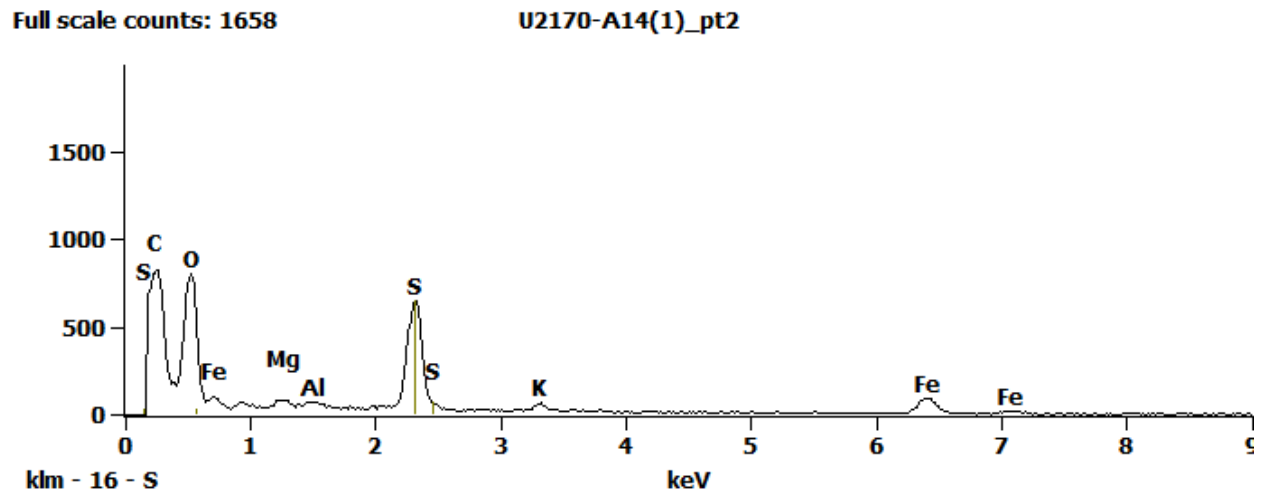


Figure 2. EDS spectra for sample U2170-A14 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 1658

U2170-A14(1)_pt3

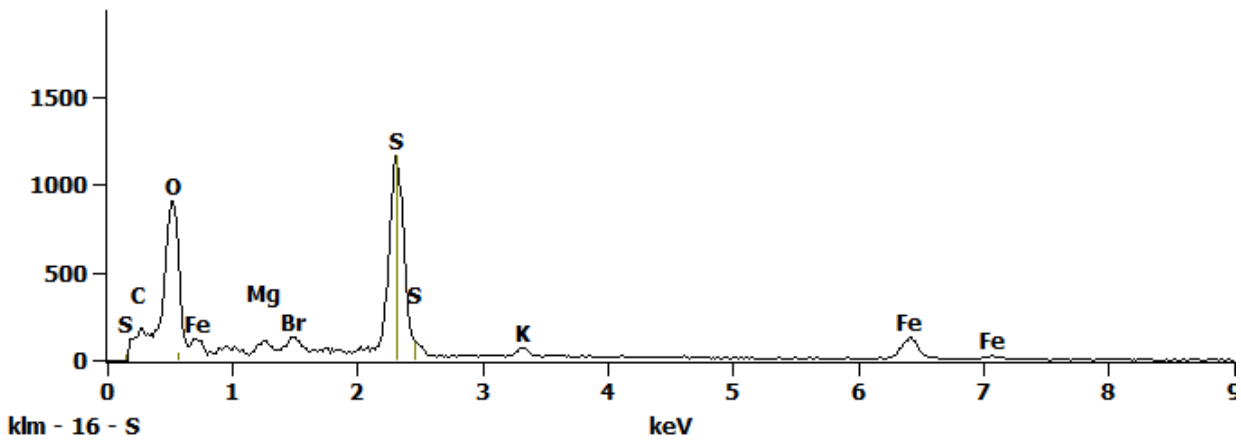
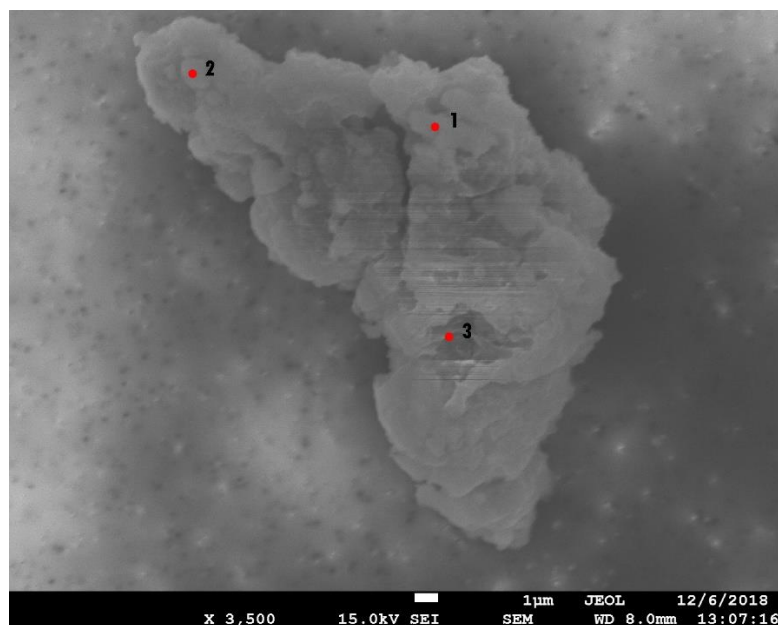


Figure 3. EDS spectra for sample U2170-A14 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A1



Particle Size:	25x15 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	
Comments:	

SEM photo of sample U2172-A1 with labeled EDS testing locations.

U2172 A1 - EDS Spectra

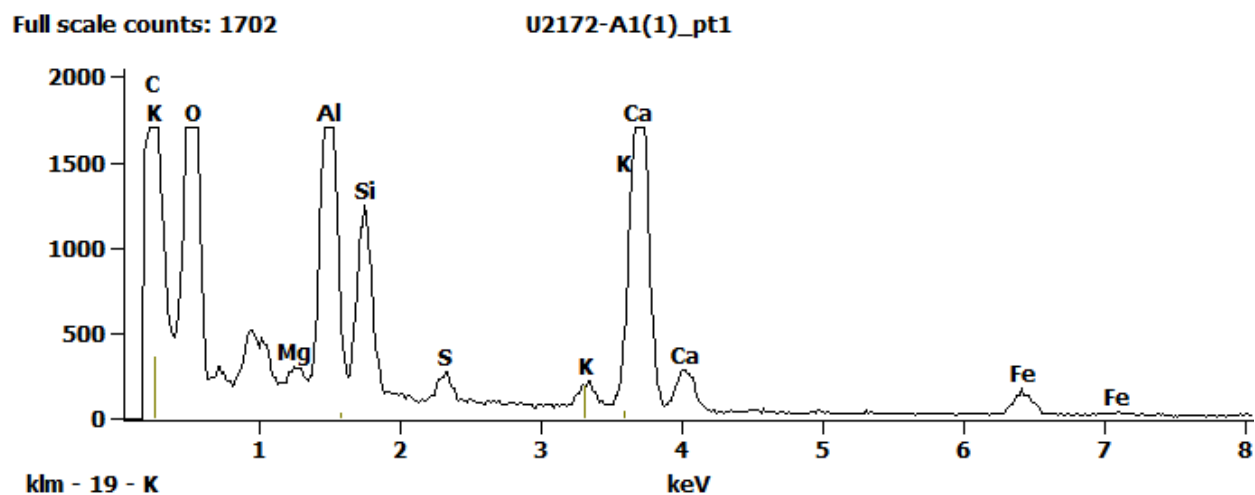


Figure 1. EDS spectra for sample U2172-A1 taken at test area 1. The test area is labeled in the particle SEM photo.

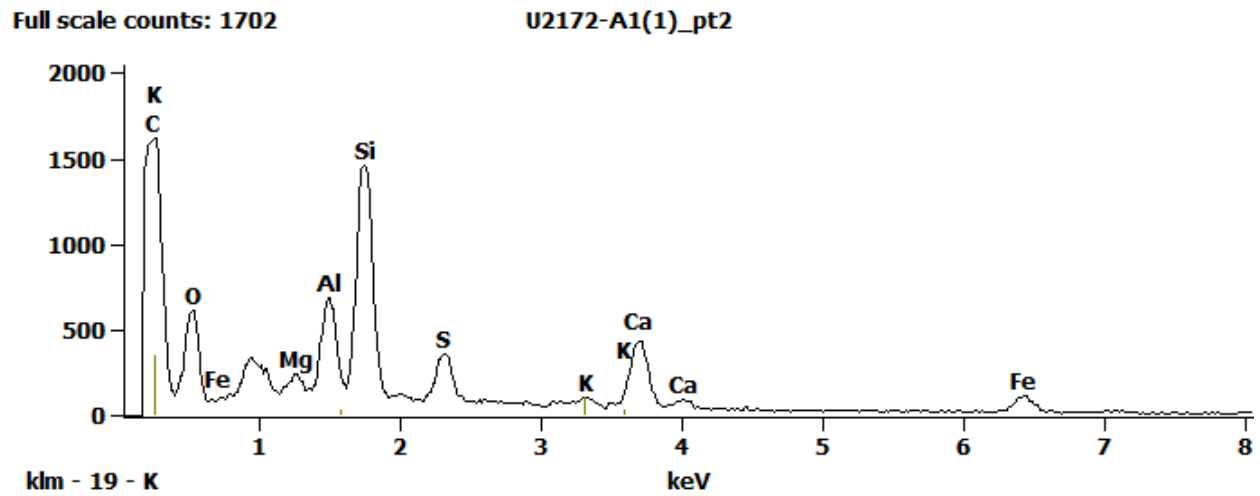


Figure 2. EDS spectra for sample U2172-A1 taken at test area 2. The test area is labeled in the particle SEM photo.

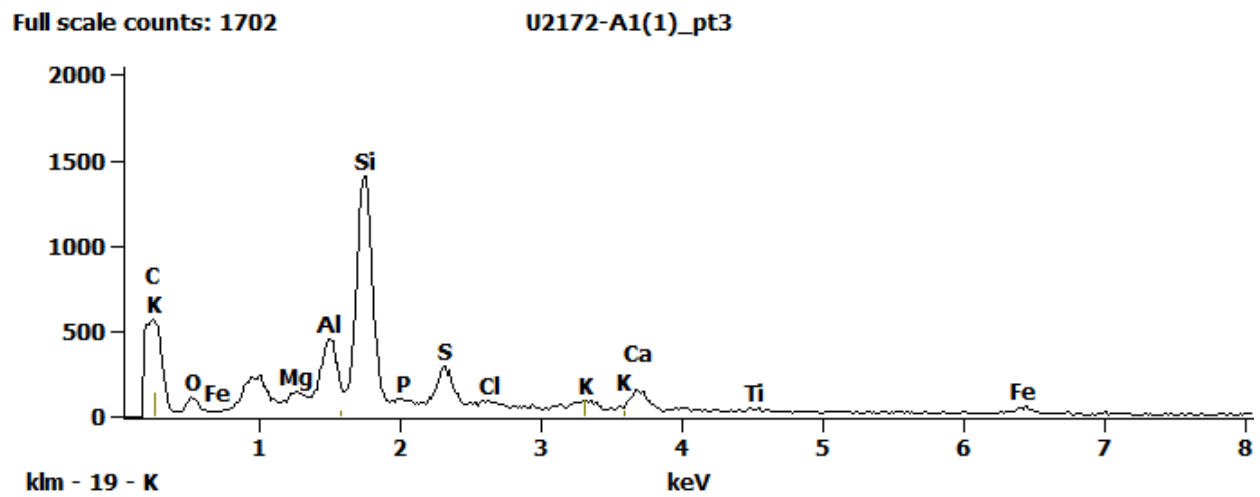
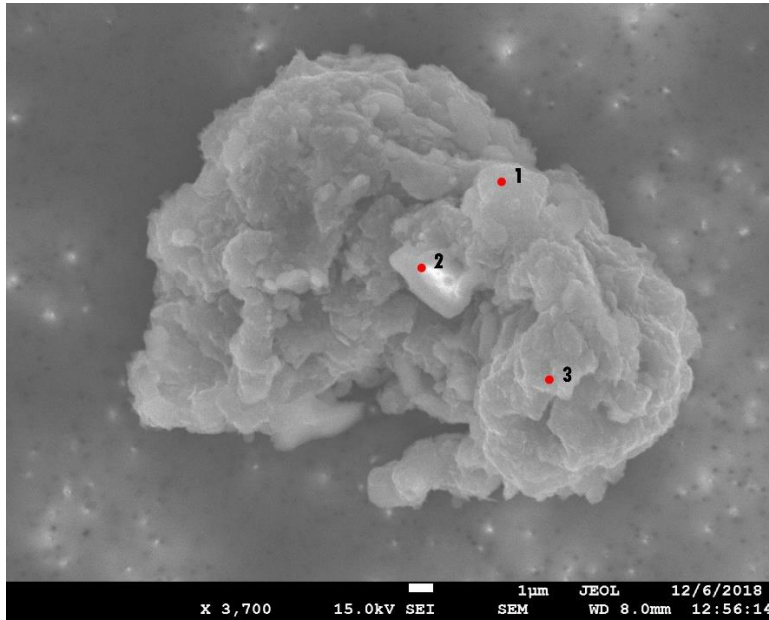


Figure 3. EDS spectra for sample U2172-A1 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A3



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

SEM photo of sample U2172-A3 with labeled EDS testing locations.

U2172 A3 - EDS Spectra

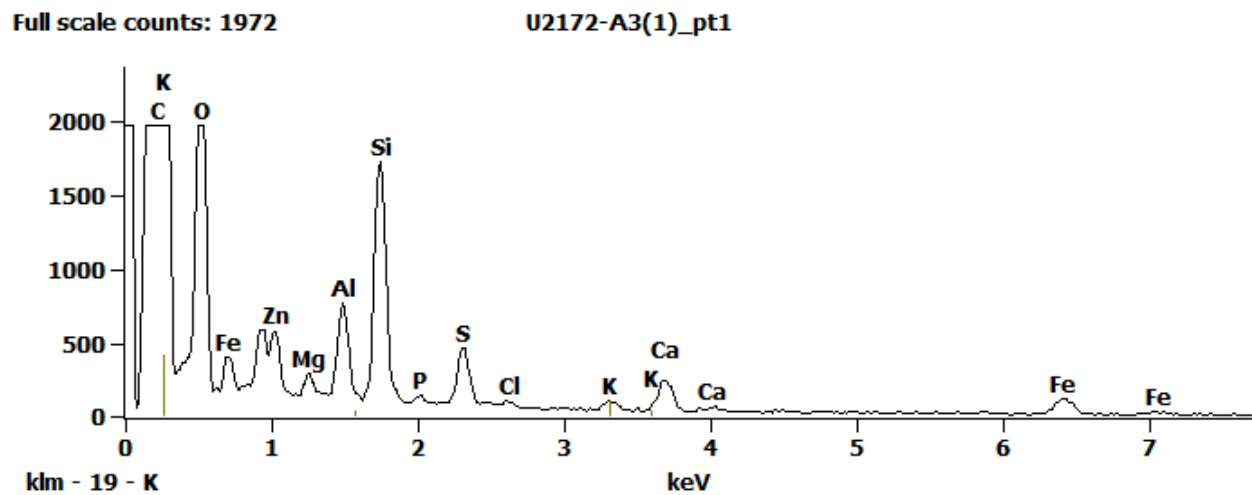


Figure 1. EDS spectra for sample U2172-A3 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 1972

U2172-A3(1)_pt2

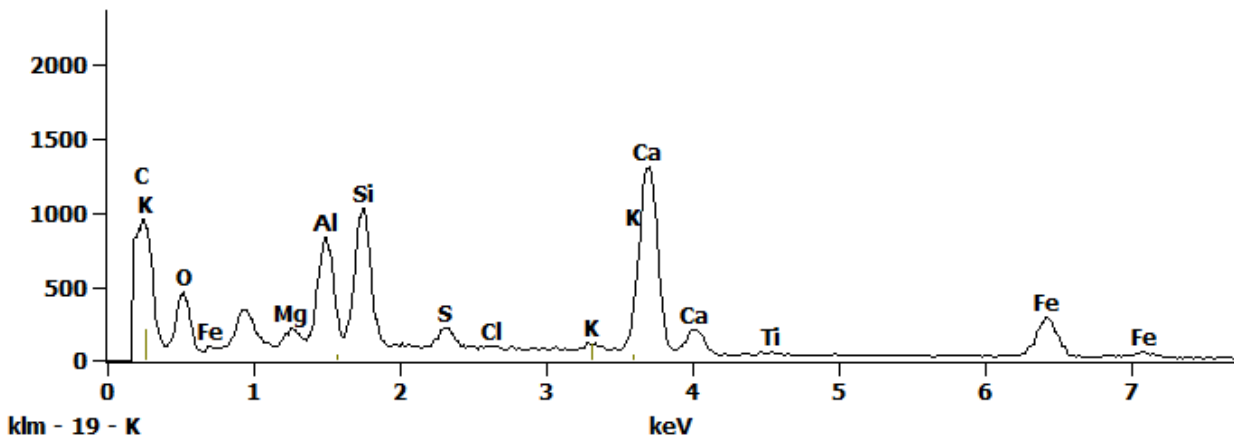


Figure 2. EDS spectra for sample U2172-A3 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 1972

U2172-A3(1)_pt3

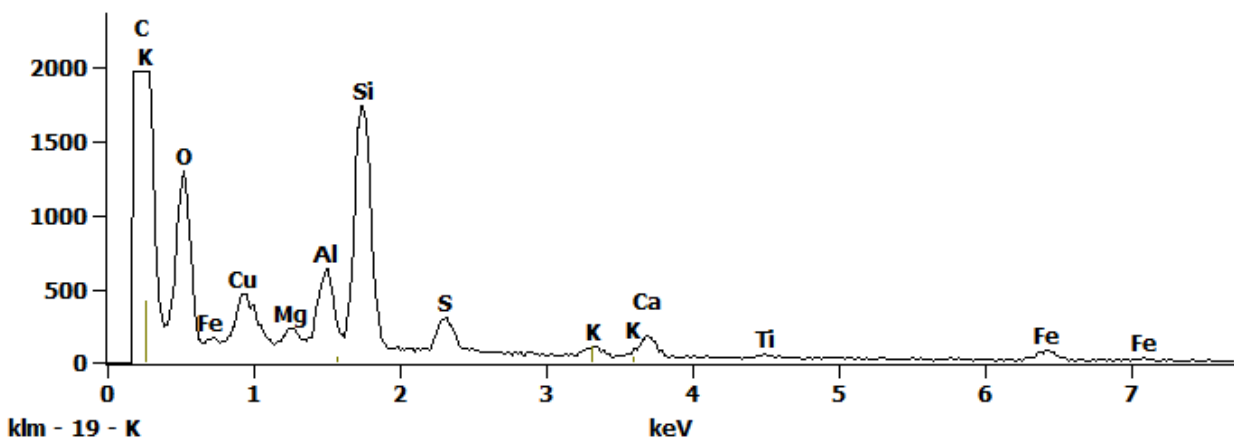
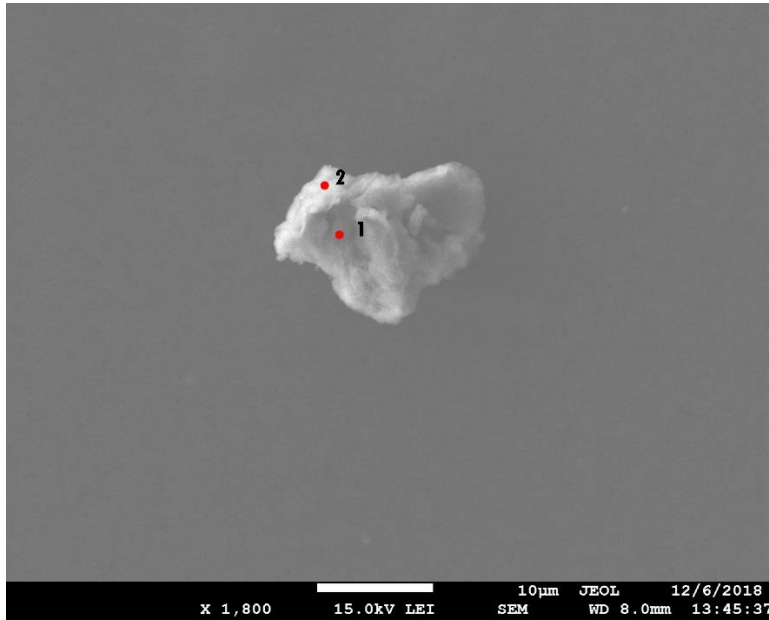


Figure 3. EDS spectra for sample U2172-A3 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A8



Particle Size:	15 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	
Comments:	

SEM photo of sample U2172-A8 with labeled EDS testing locations.

U2172 A8 - EDS Spectra

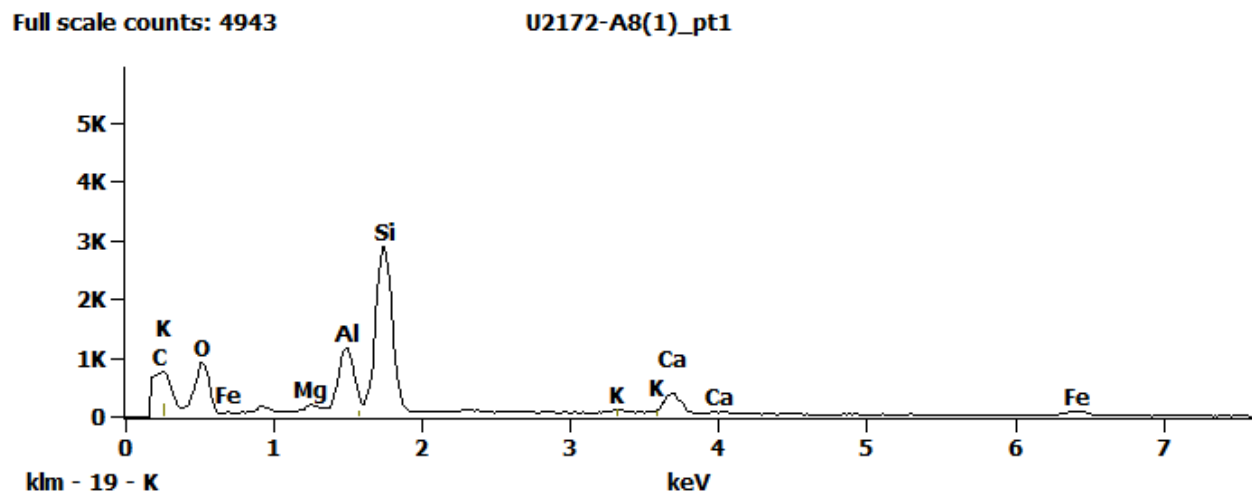


Figure 1. EDS spectra for sample U2172-A8 taken at test area 1. The test area is labeled in the particle SEM photo.

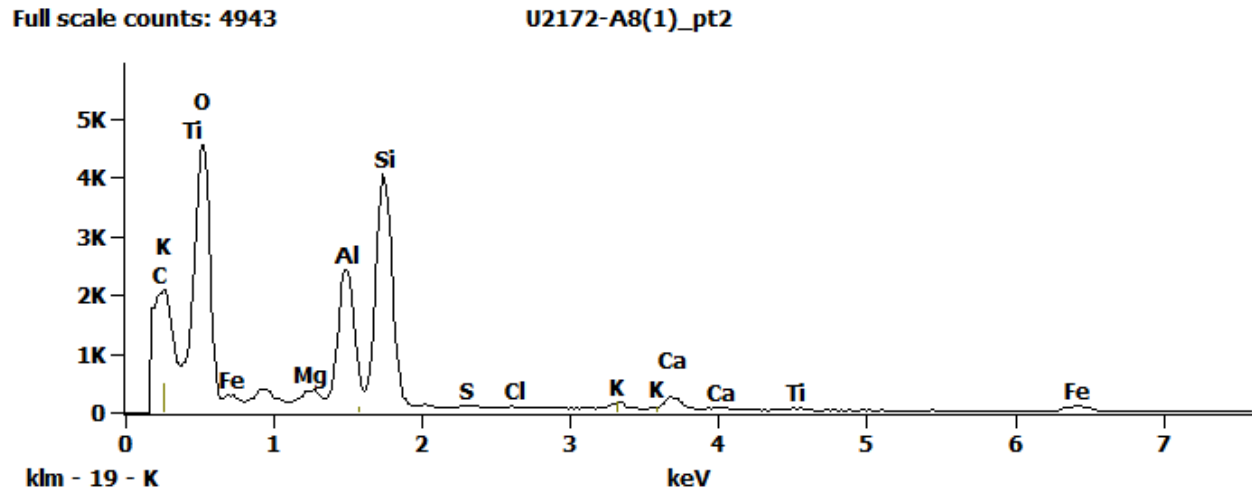
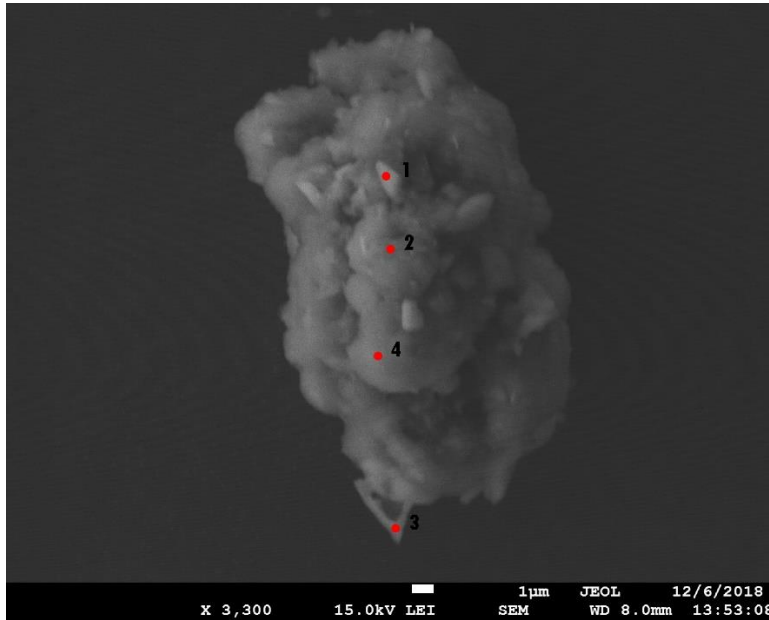


Figure 2. EDS spectra for sample U2172-A8 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 A9



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

SEM photo of sample U2172-A9 with labeled EDS testing locations.

U2172 A9 - EDS Spectra

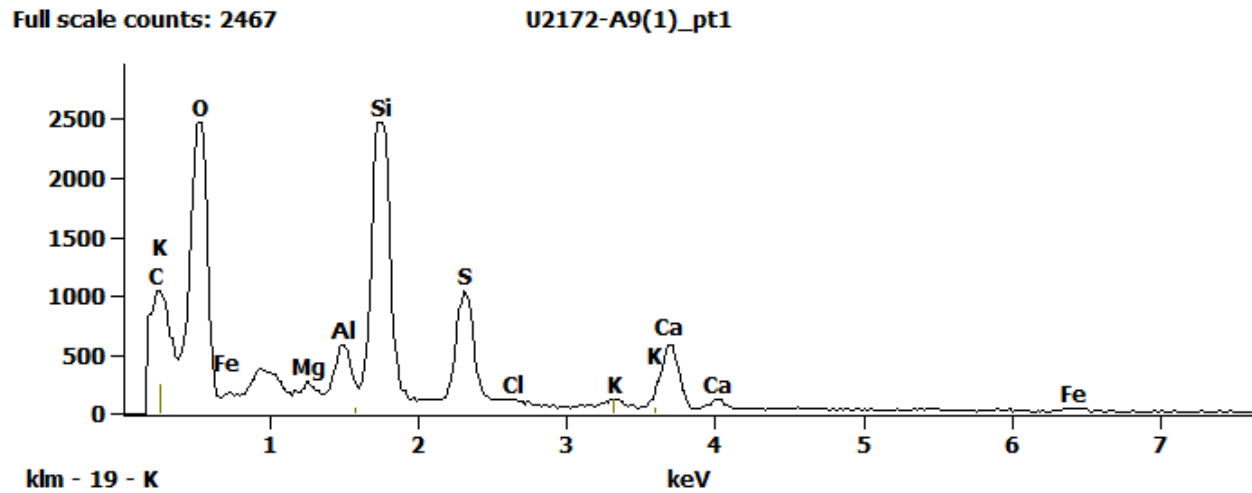


Figure 1. EDS spectra for sample U2172-A9 taken at test area 1. The test area is labeled in the particle SEM photo.

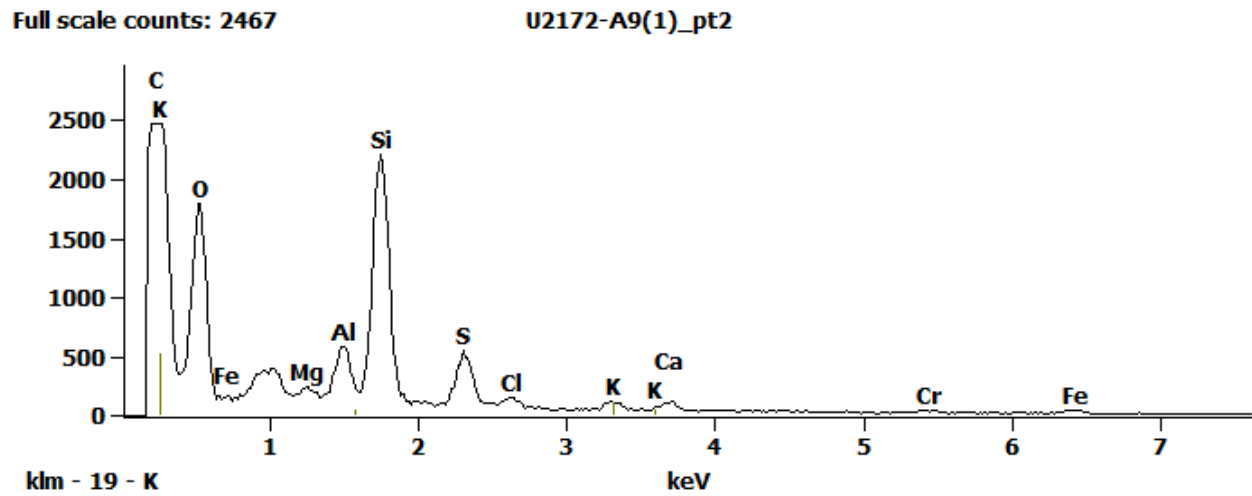


Figure 2. EDS spectra for sample U2172-A9 taken at test area 2. The test area is labeled in the particle SEM photo.

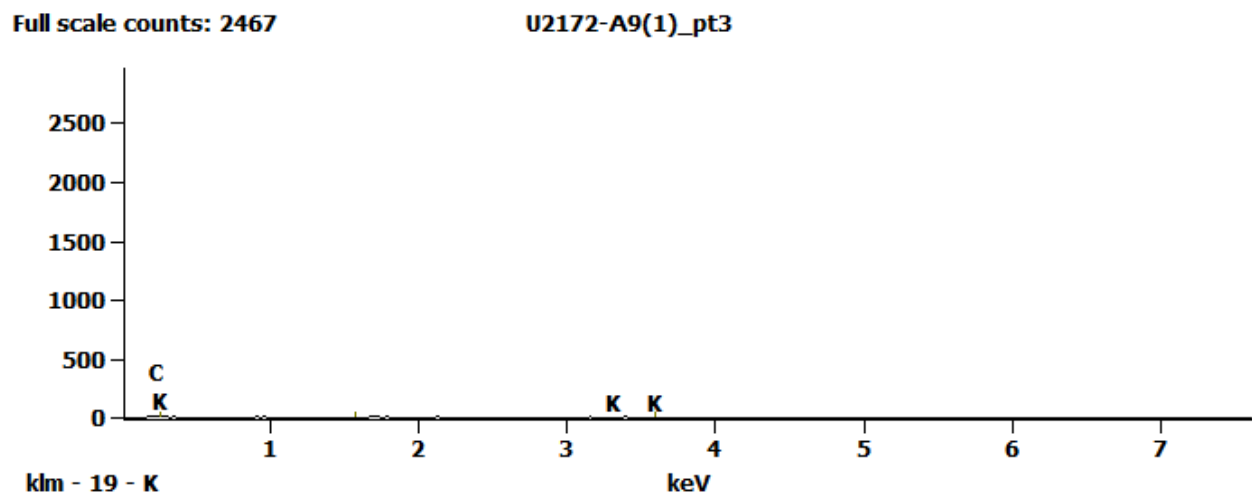


Figure 3. EDS spectra for sample U2172-A9 taken at test area 3. The test area is labeled in the particle SEM photo.

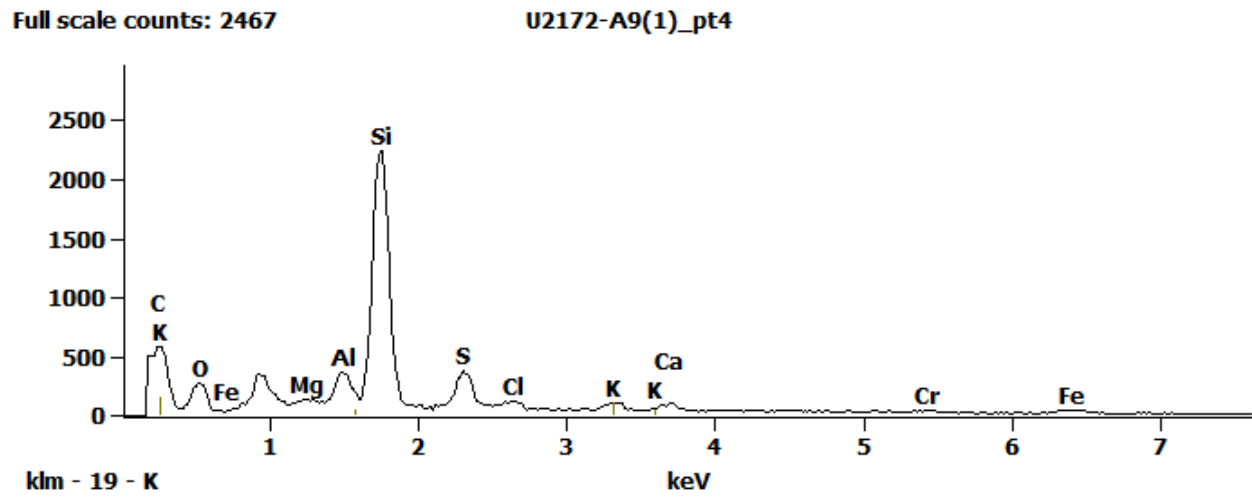
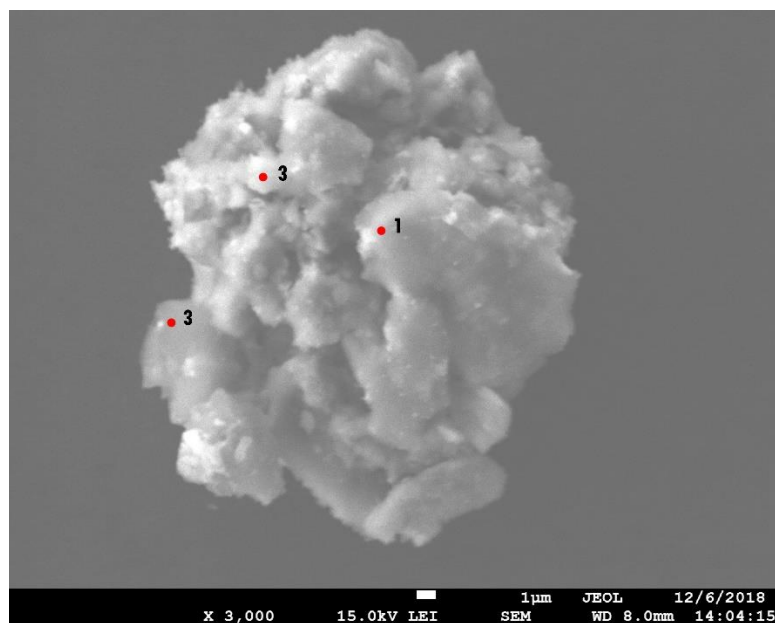


Figure 4. EDS spectra for sample U2172-A9 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 A10



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

SEM photo of sample U2172-A10 with labeled EDS testing locations..

U2172 A10 - EDS Spectra

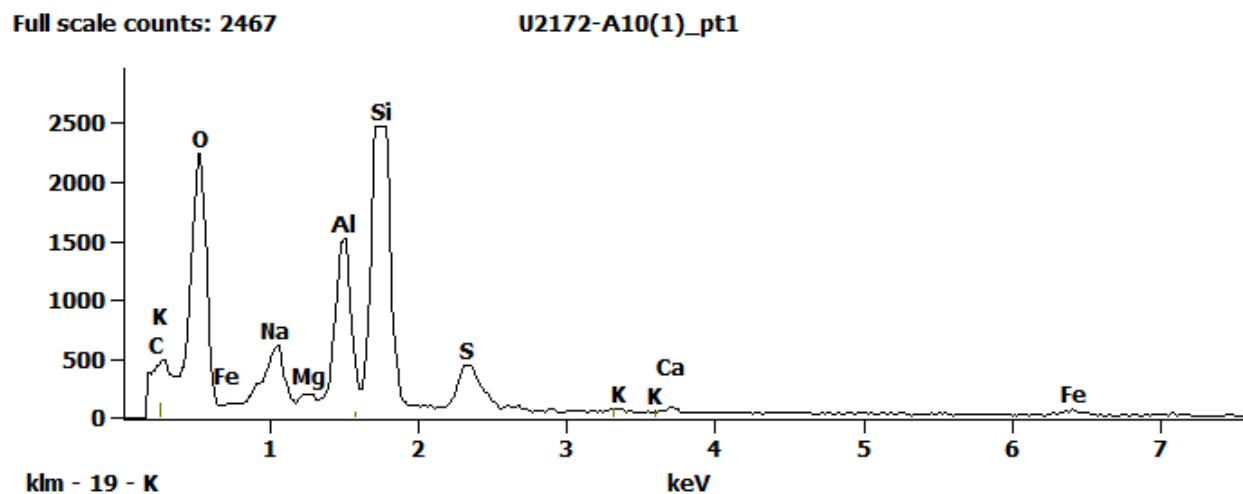


Figure 1. EDS spectra for sample U2172-A10 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 2467

U2172-A10(1)_pt2

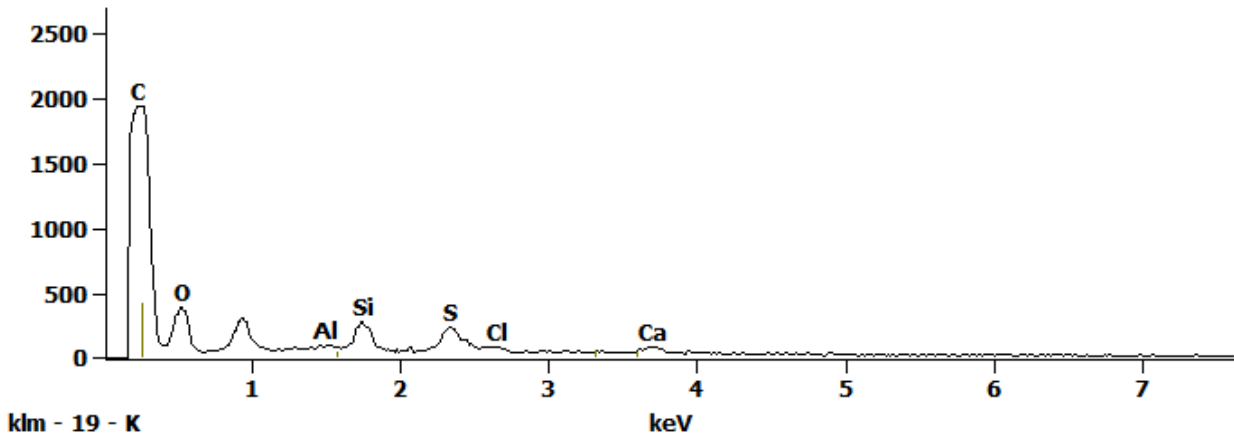


Figure 2. EDS spectra for sample U2172-A10 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 2467

U2172-A10(1)_pt3

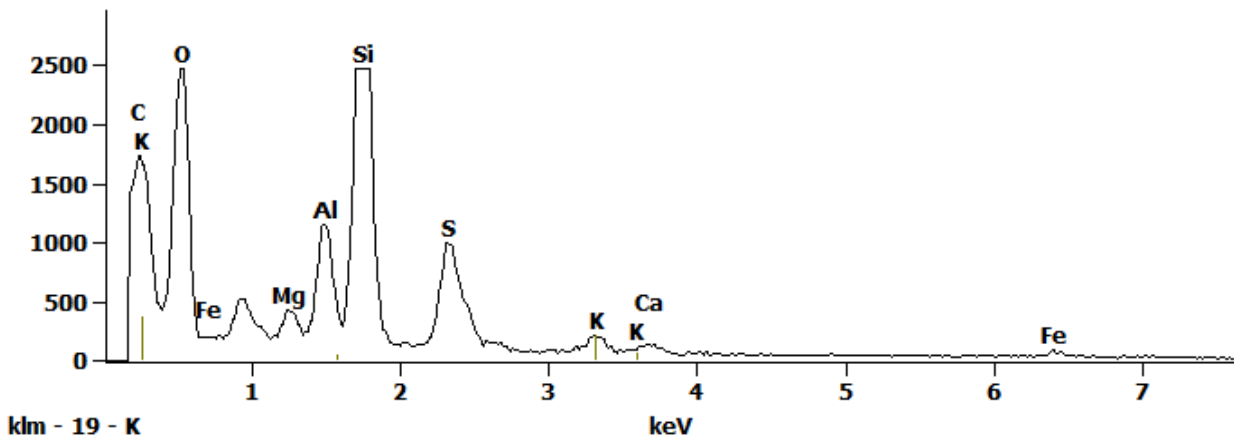
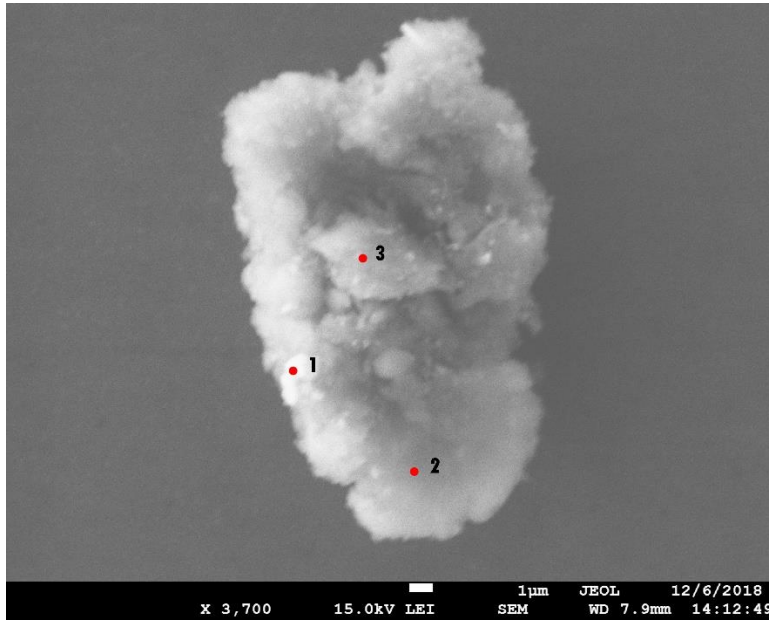


Figure 3. EDS spectra for sample U2172-A10 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A11



Particle Size:	18 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	
Comments:	

SEM photo of sample U2172-A11 with labeled EDS testing locations..

U2172 A11 - EDS Spectra

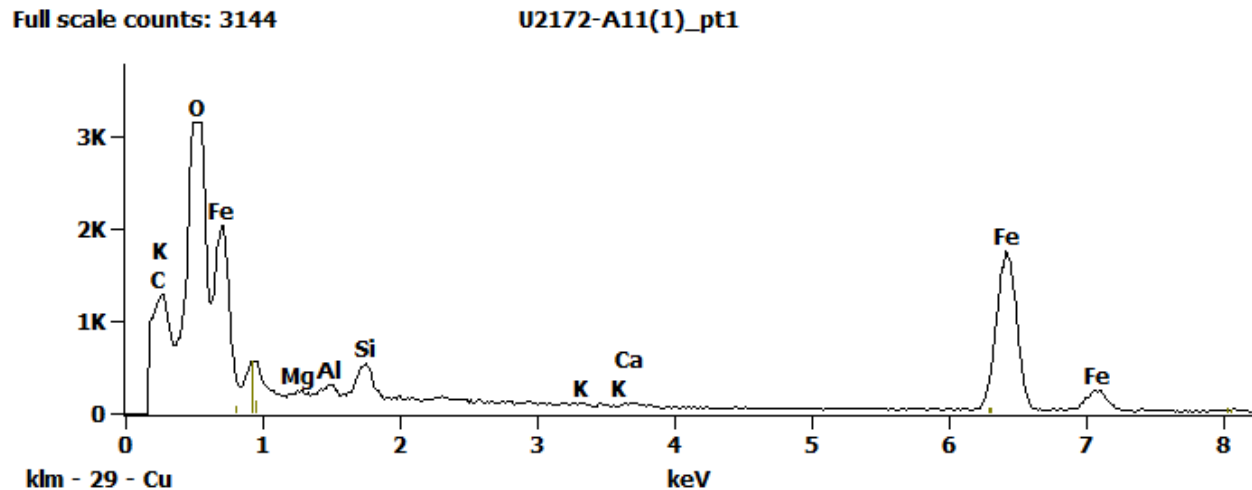


Figure 1. EDS spectra for sample U2172-A11 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 3144

U2172-A11(1)_pt2

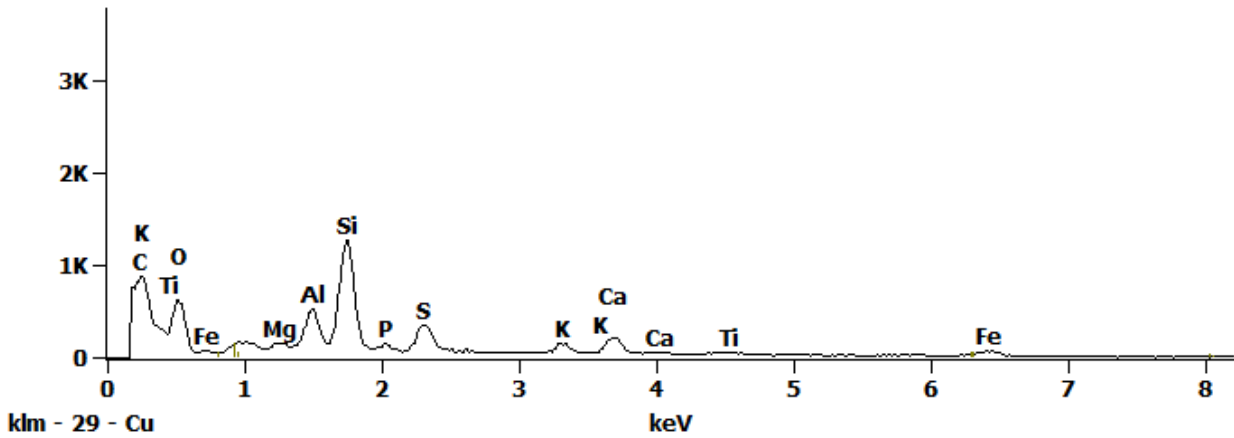


Figure 2. EDS spectra for sample U2172-A11 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 3144

U2172-A11(1)_pt3

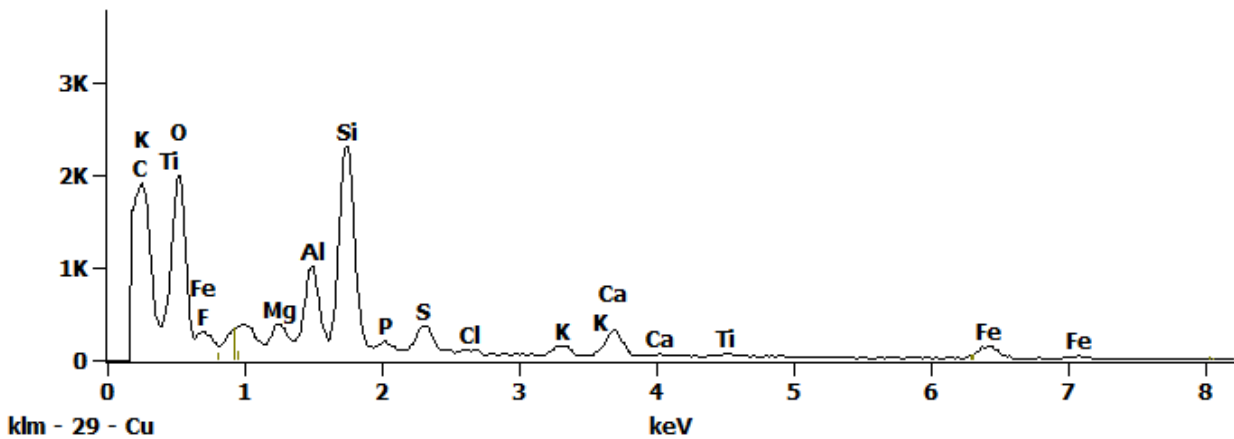
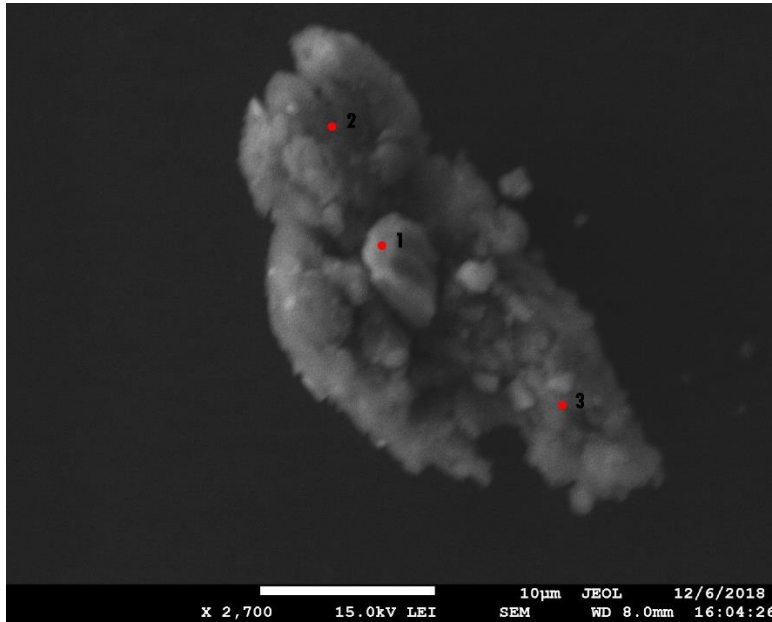


Figure 3. EDS spectra for sample U2172-A11 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A14



Particle Size:	31x16 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	
Comments:	

SEM photo of sample U2172-A14 with labeled EDS testing locations..

U2172 A14 - EDS Spectra

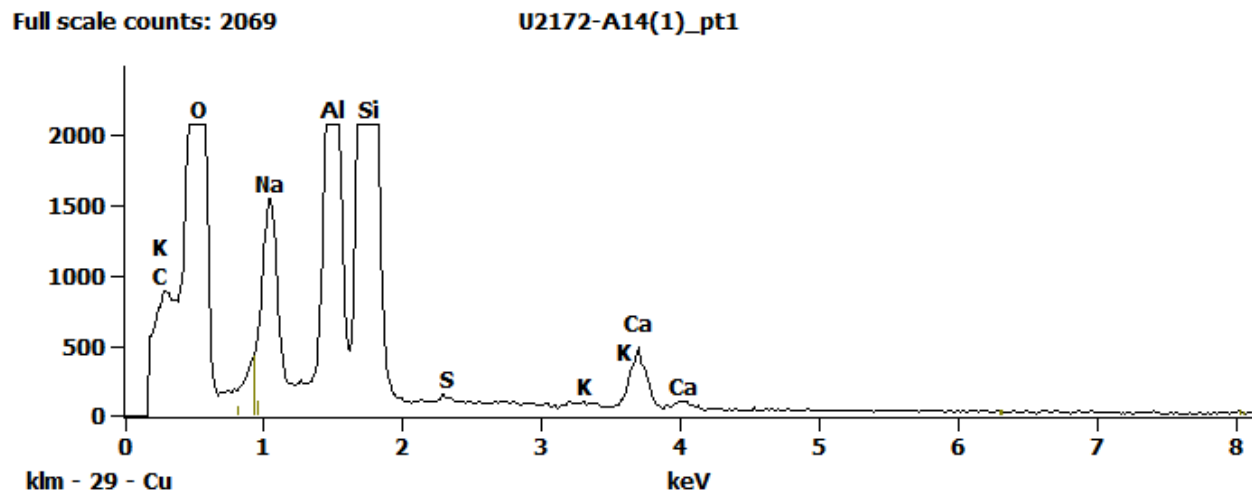


Figure 1. EDS spectra for sample U2172-A14 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 2069

U2172-A14(1)_pt2

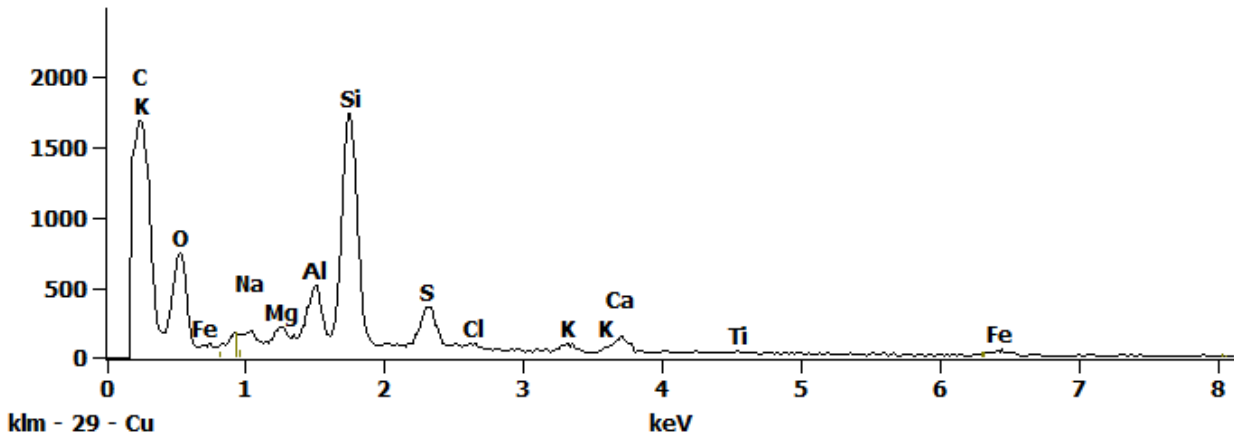


Figure 2. EDS spectra for sample U2172-A14 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 2069

U2172-A14(1)_pt3

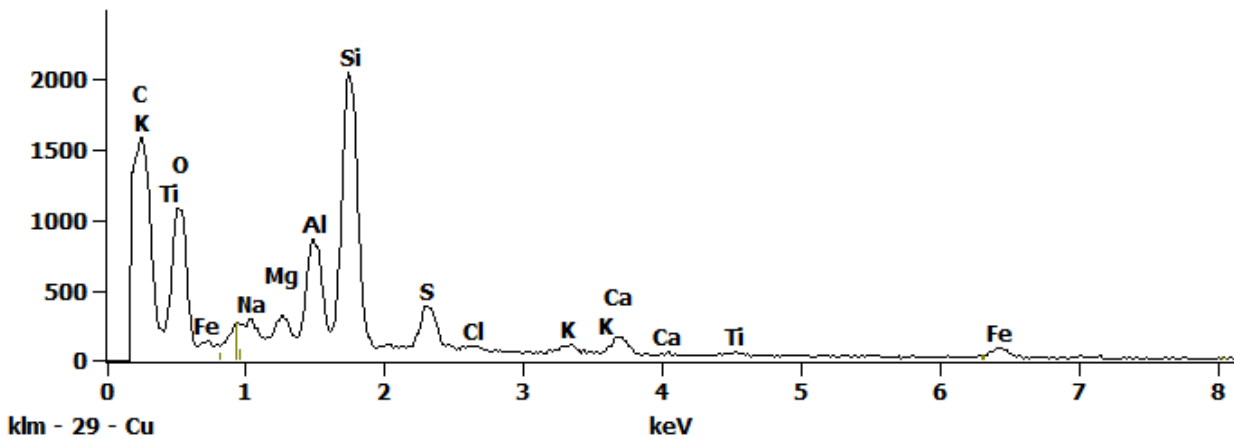
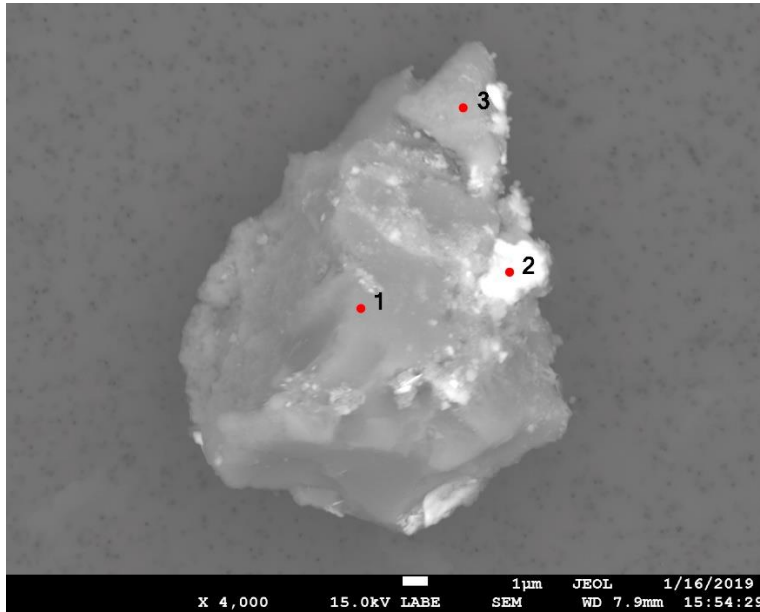


Figure 3. EDS spectra for sample U2172-A14 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B8



Particle Size:	18 µm
Shape:	Irregular to Equidimensional
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	U2172 Cluster 4
Comments:	

SEM photo of sample U2172-B8 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 4

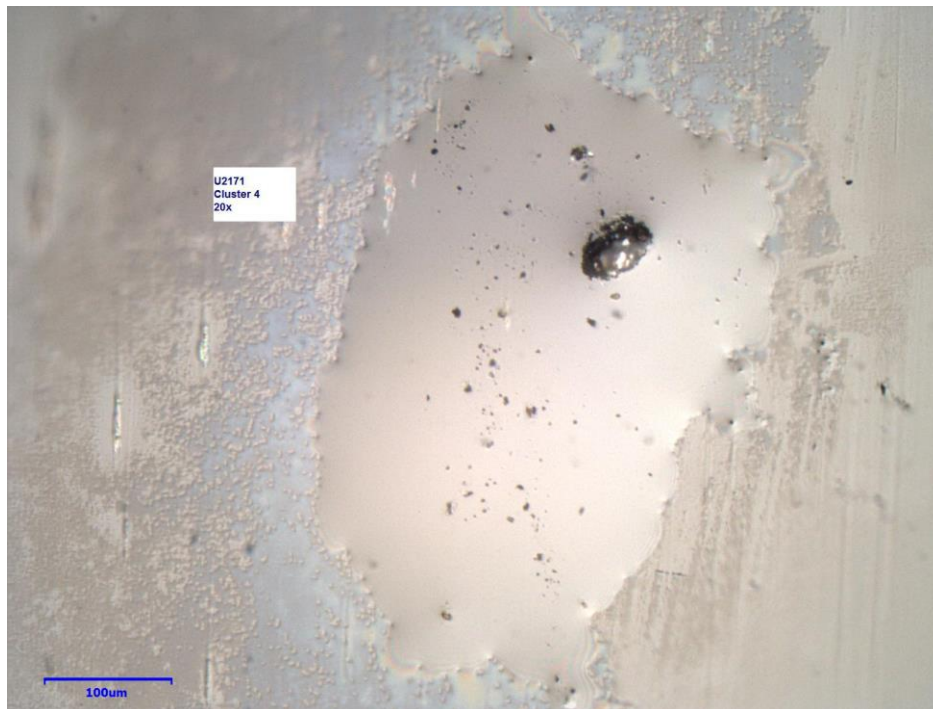


Photo of cluster U2172 Cluster 4.

U2172 B8 - EDS Spectra

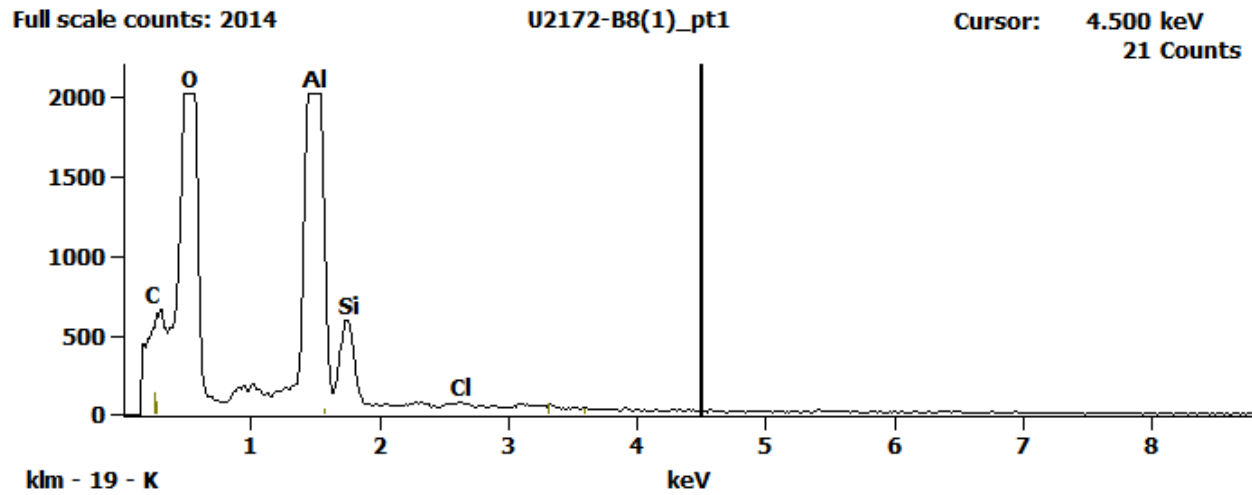


Figure 1. EDS spectra for sample U2172-B8 taken at test area 1. The test area is labeled in the particle SEM photo.

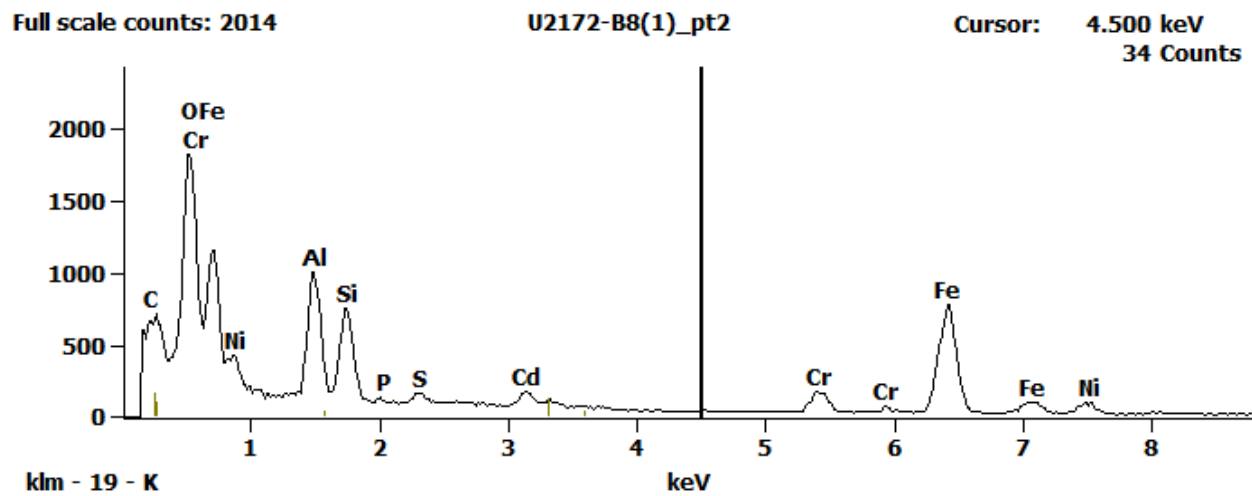


Figure 2. EDS spectra for sample U2172-B8 taken at test area 2. The test area is labeled in the particle SEM photo.

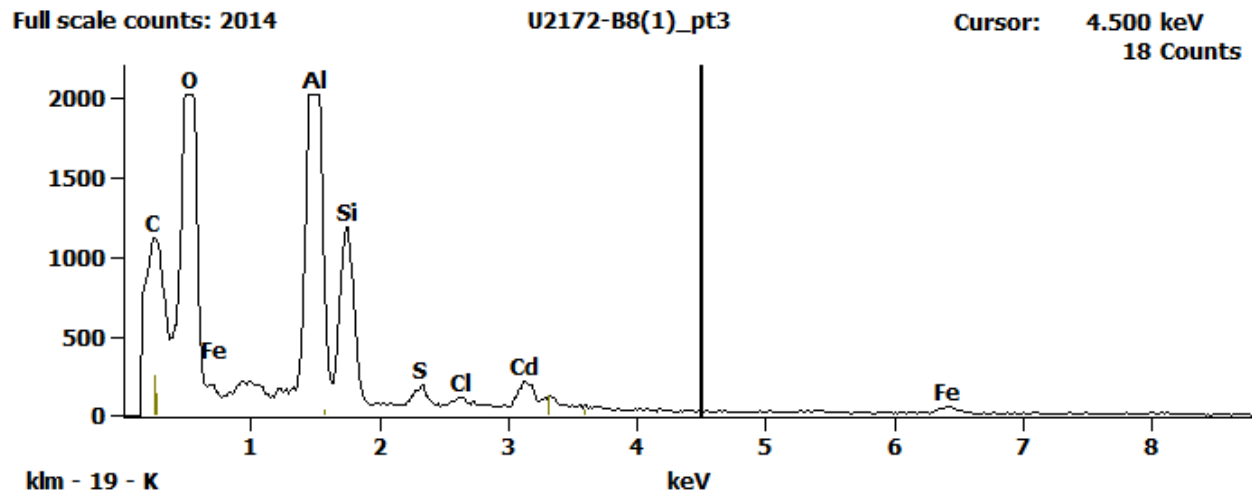
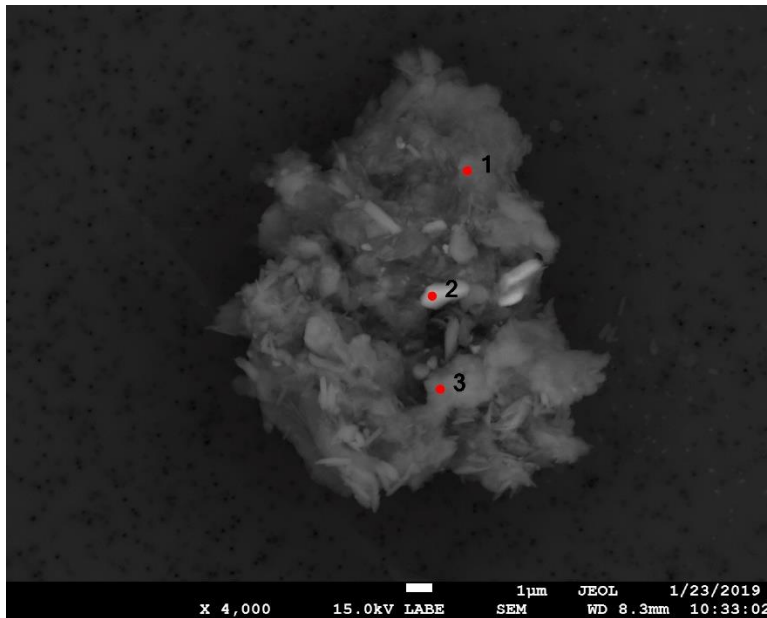


Figure 3. EDS spectra for sample U2172-B8 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C15



Particle Size:	12 µm
Shape:	Equidimensional
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY COSMIC
Cluster No.:	
Comments:	

SEM Photo of sample U2172-C15 with labeled EDS testing locations.

U2172 C15 - EDS Spectra

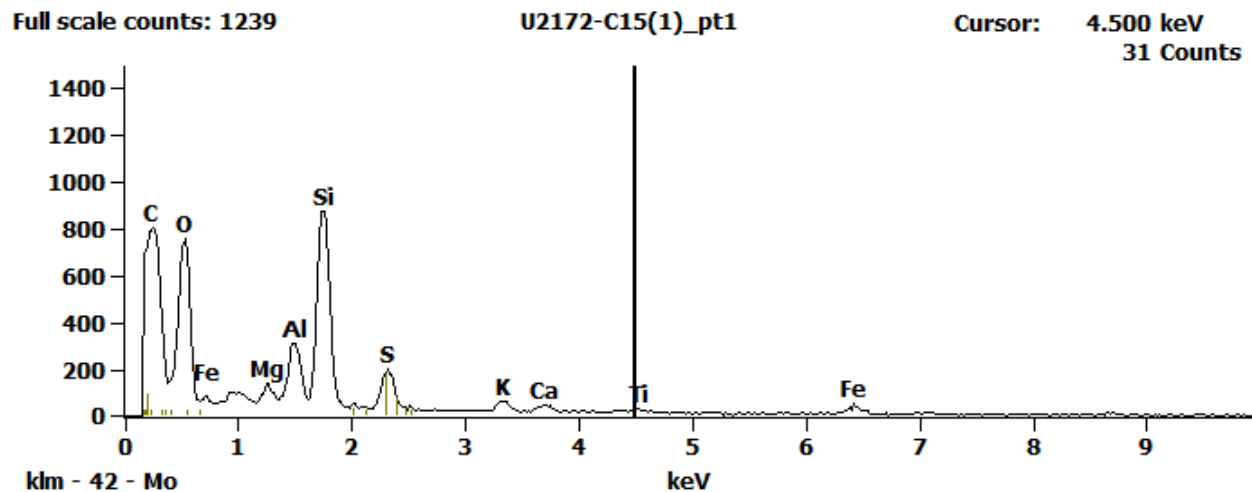


Figure 1. EDS Spectra for sample U2172-C15 taken at test area 1. The test area is labeled in the particle SEM photo.

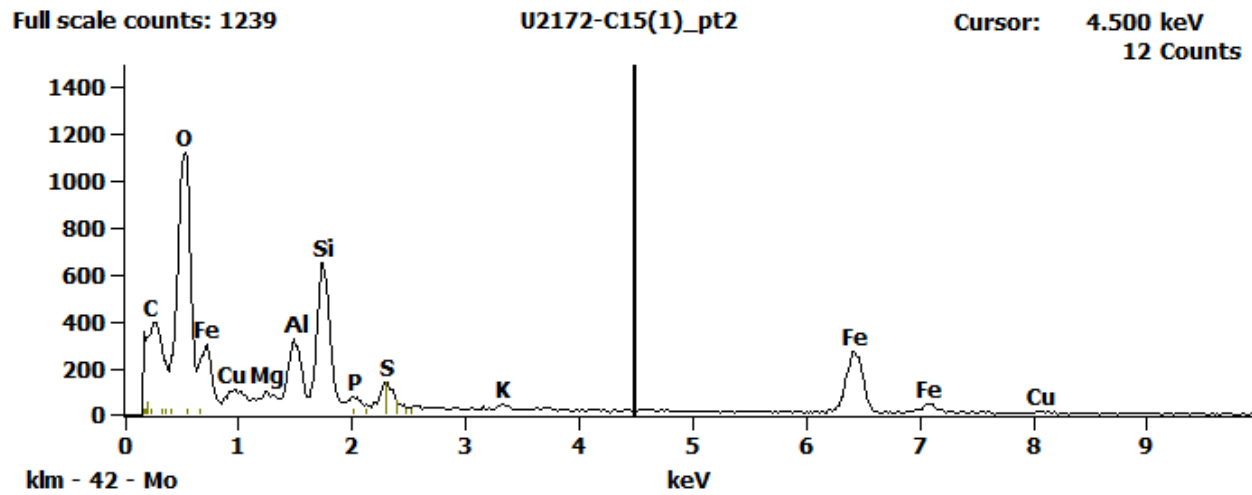


Figure 2. EDS Spectra for sample U2172-C15 taken at test area 2. The test area is labeled in the particle SEM photo.

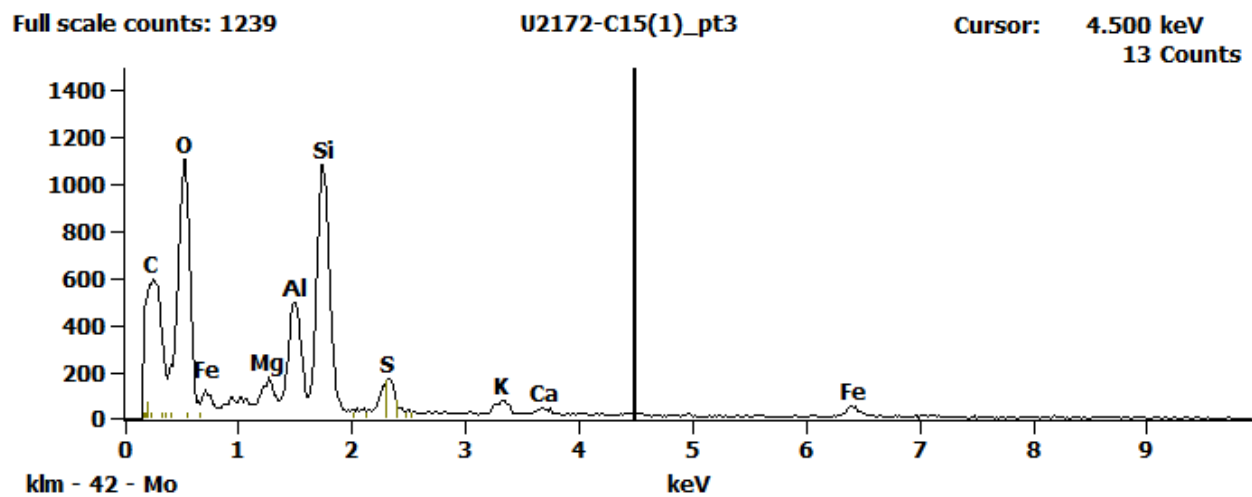
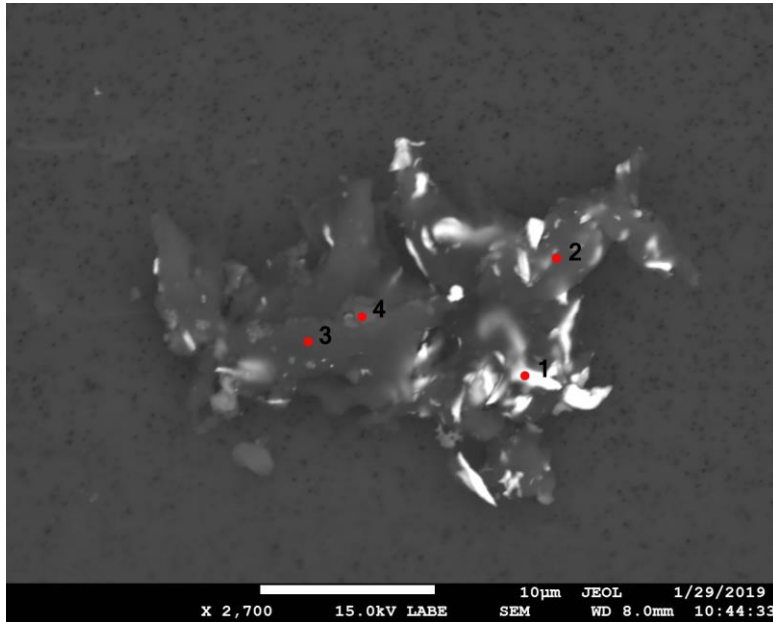


Figure 3. EDS Spectra for sample U2172-C15 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D12



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

SEM photo of sample U2172-D12 with labeled EDS testing locations.

U2172 D12 - EDS Spectra

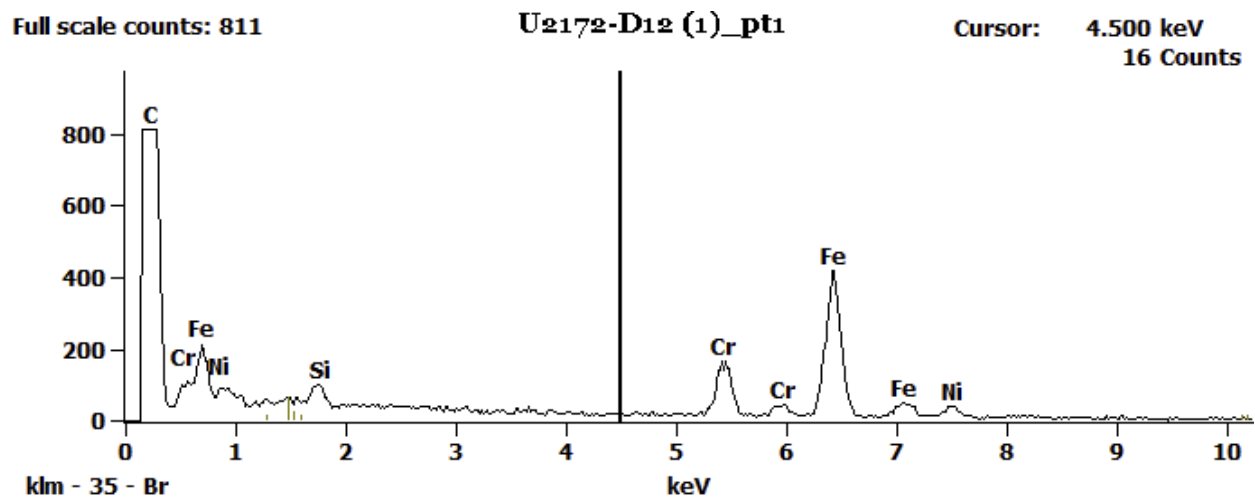


Figure 1. EDS spectra for sample U2172-D12 taken at test area 1. The test area is labeled in the particle SEM photo.

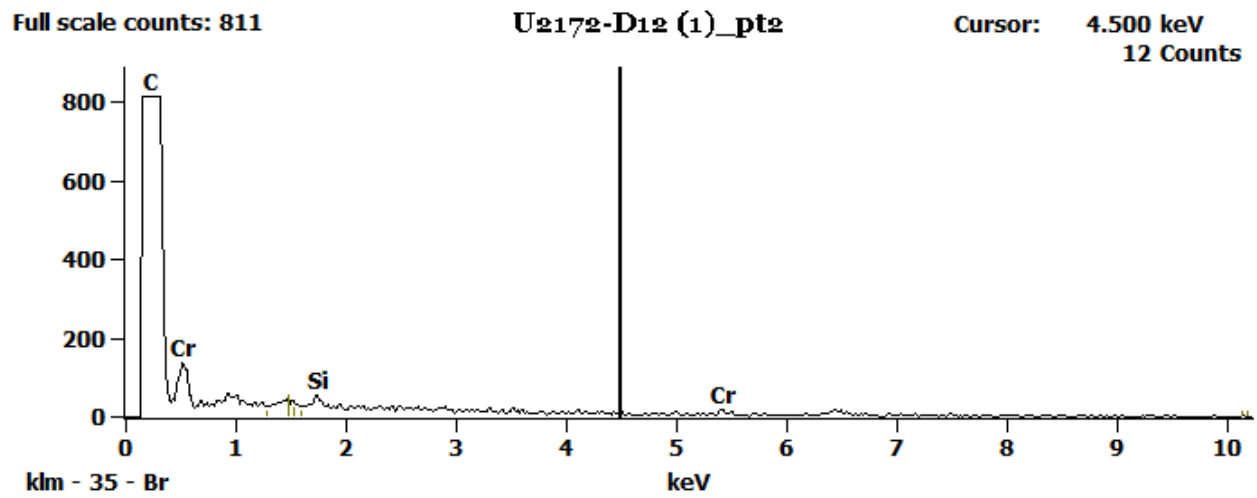


Figure 2. EDS spectra for sample U2172-D12 taken at test area 2. The test area is labeled in the particle SEM photo.

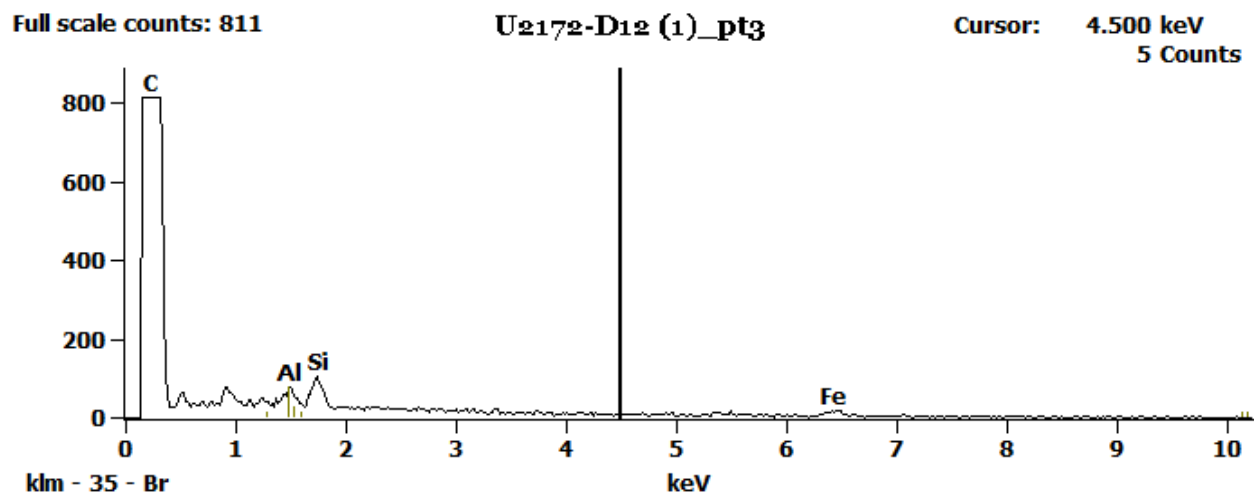


Figure 3. EDS spectra for sample U2172-D12 taken at test area 3. The test area is labeled in the particle SEM photo.

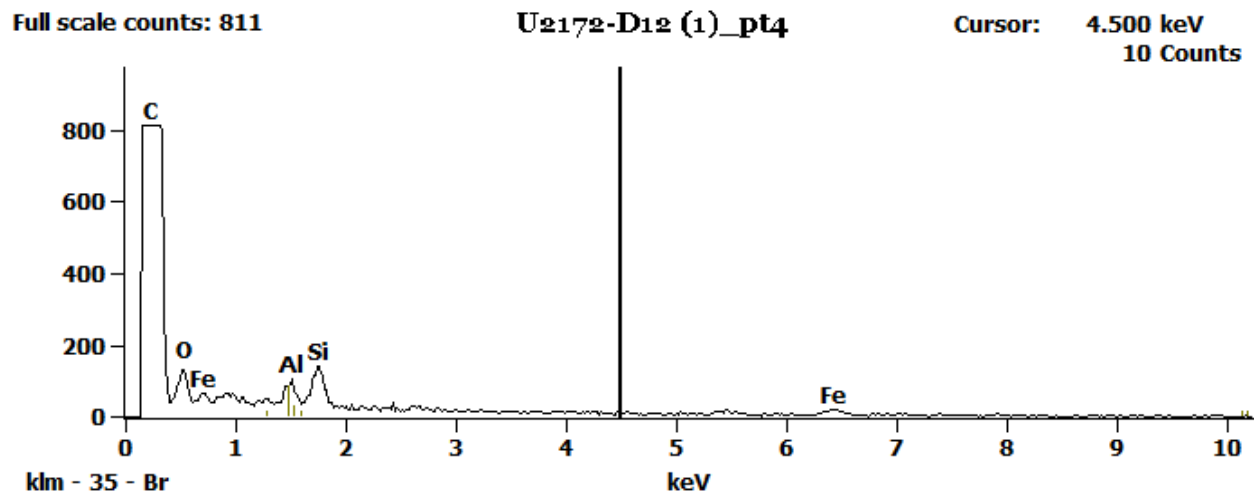
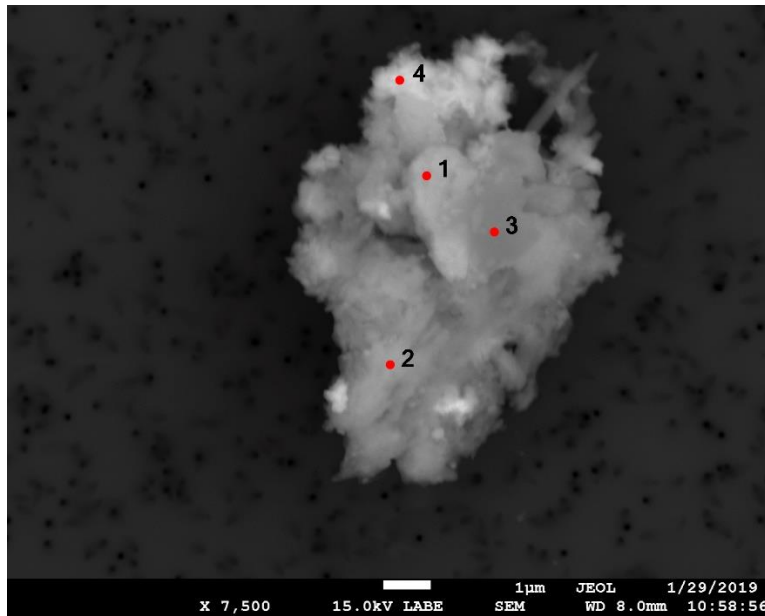


Figure 4. EDS spectra for sample U2172-D12 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 D15



Particle Size:	10 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Dull
Particle Type:	COSMIC
Cluster No.:	
Comments:	

SEM photo of sample U2172-D15 with labeled EDS testing locations.

U2172 D15 - EDS Spectra

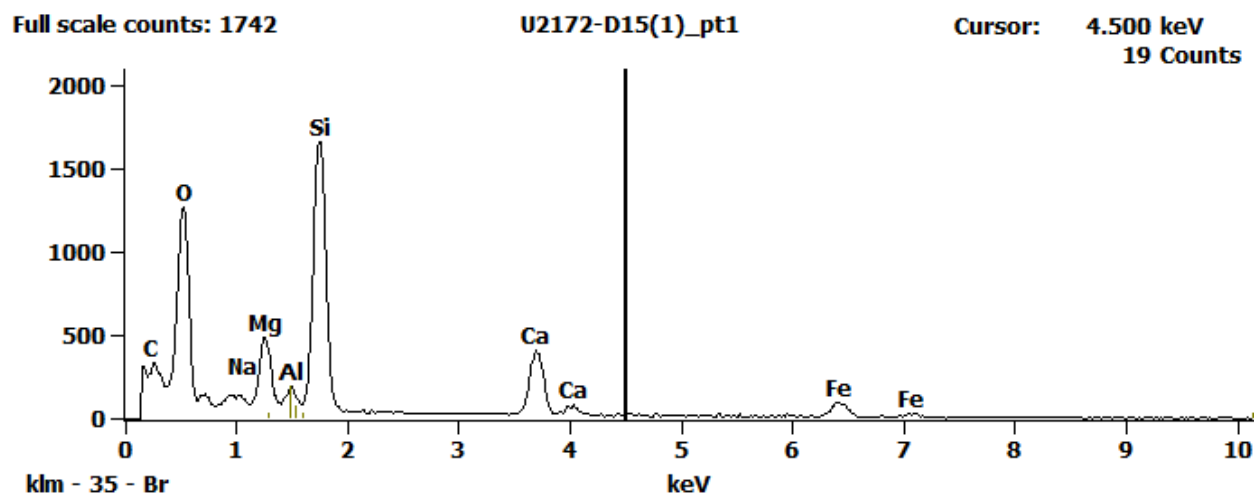


Figure 1. EDS spectra for sample U2172-D15 taken at test area 1. The test area is labeled in the particle SEM photo..

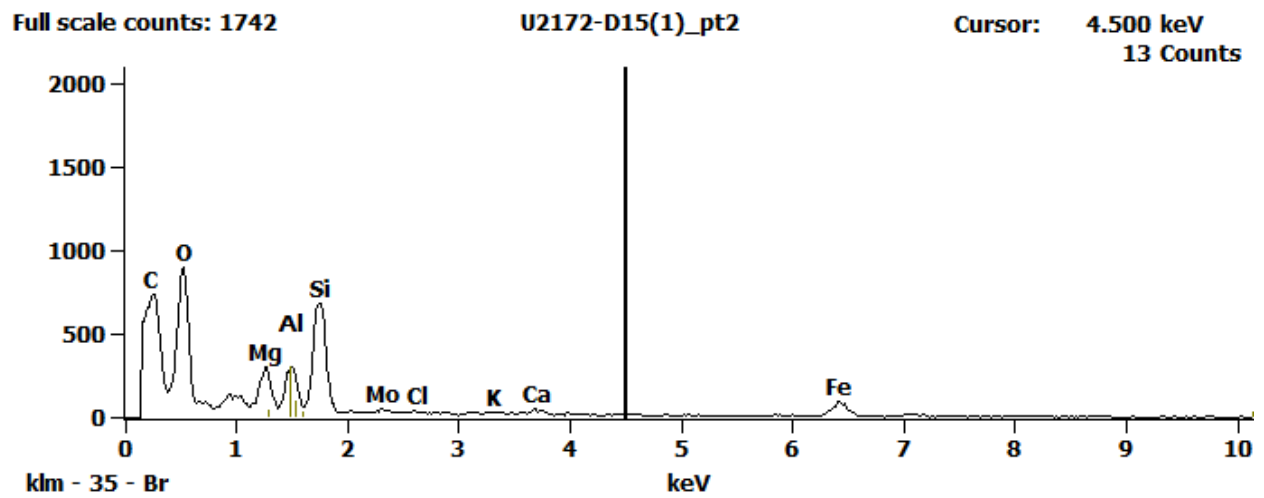


Figure 2. EDS spectra for sample U2172-D15 taken at test area 2. The test area is labeled in the particle SEM photo.

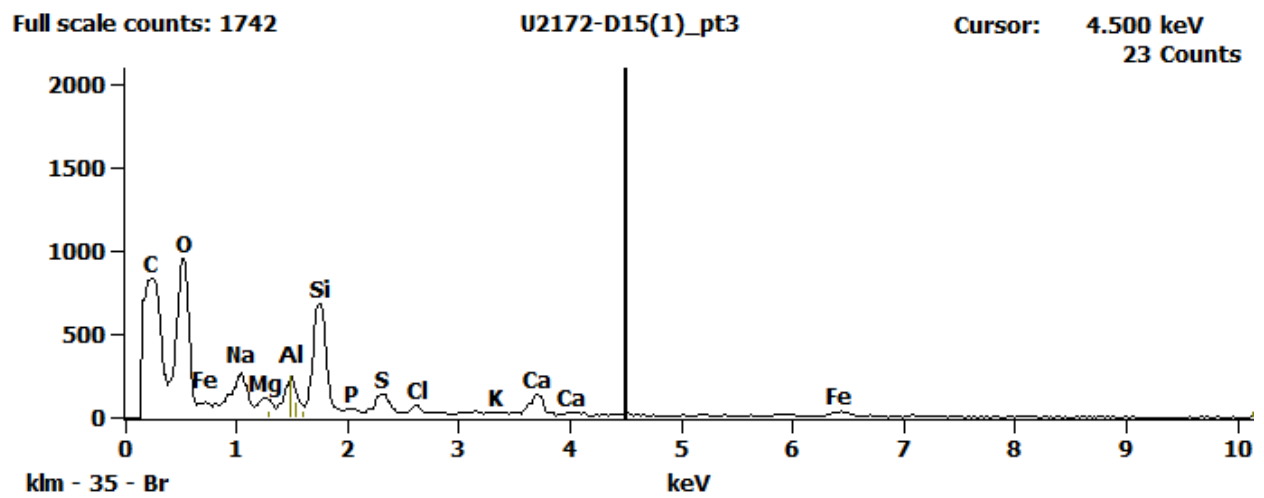


Figure 3. EDS spectra for sample U2172-D15 taken at test area 3. The test area is labeled in the particle SEM photo.

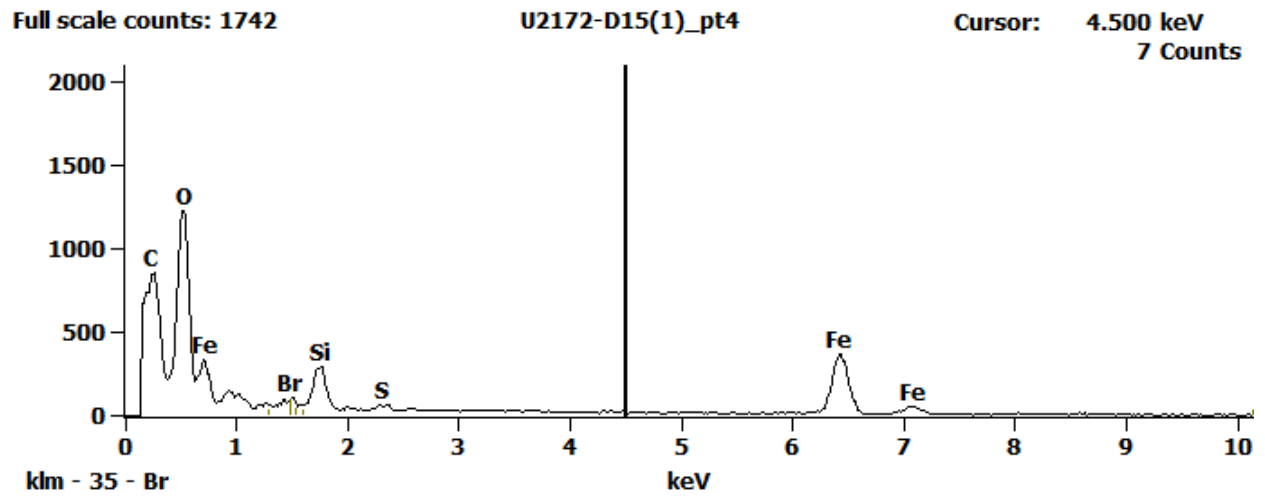
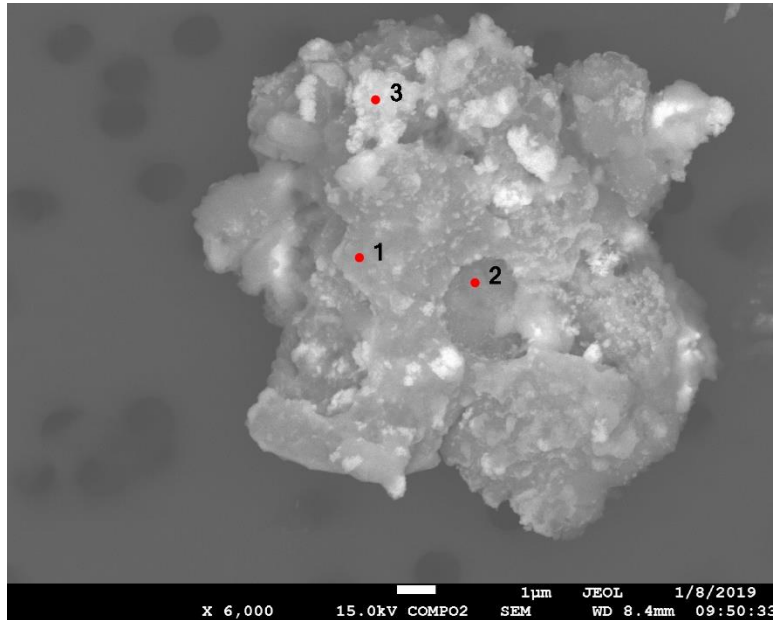


Figure 4. EDS spectra for sample U2172-D15 taken at test area 4. The test area is labeled in the particle SEM photo.

Particle Descriptions

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

U2170 A2



Particle Size:	15 µm
Shape:	Equidimensional
Transparency:	Translucent
Color:	GRAY
Luster:	Pearly to Vitreous
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 1
Comments:	

SEM photo of sample U2170-A2 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 1

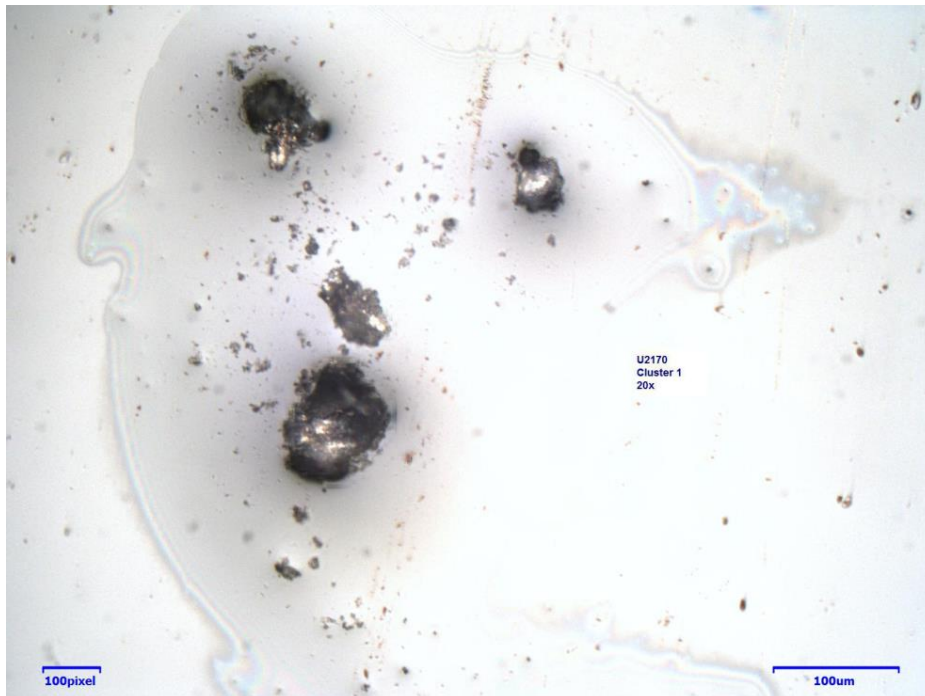


Photo of cluster U2170 Cluster 1.

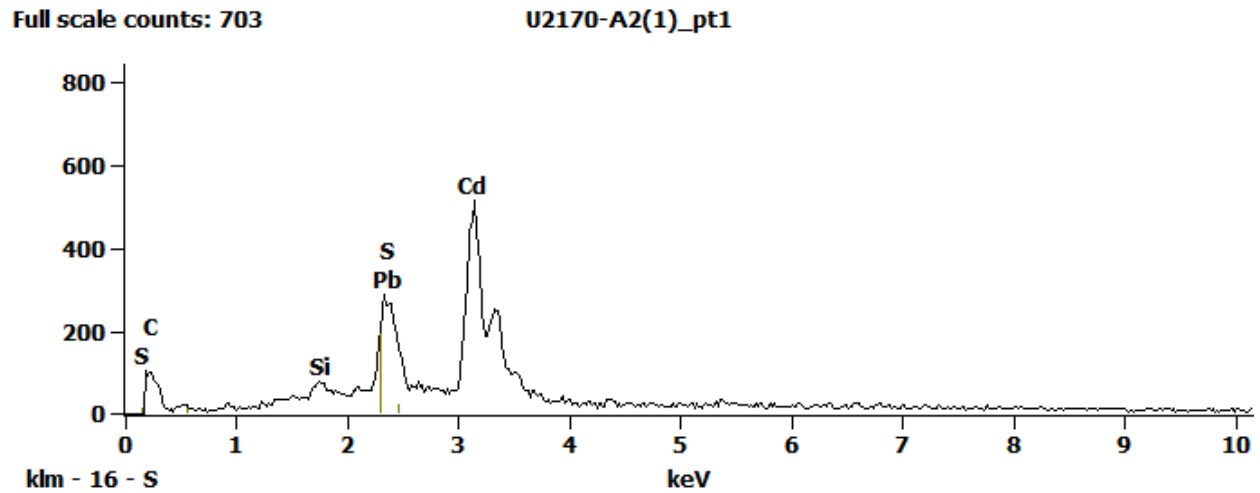
U2170 A2 - EDS Spectra

Figure 1. EDS spectra for sample U2170-A2 taken at test area 1. The test area is labeled in the particle SEM photo.

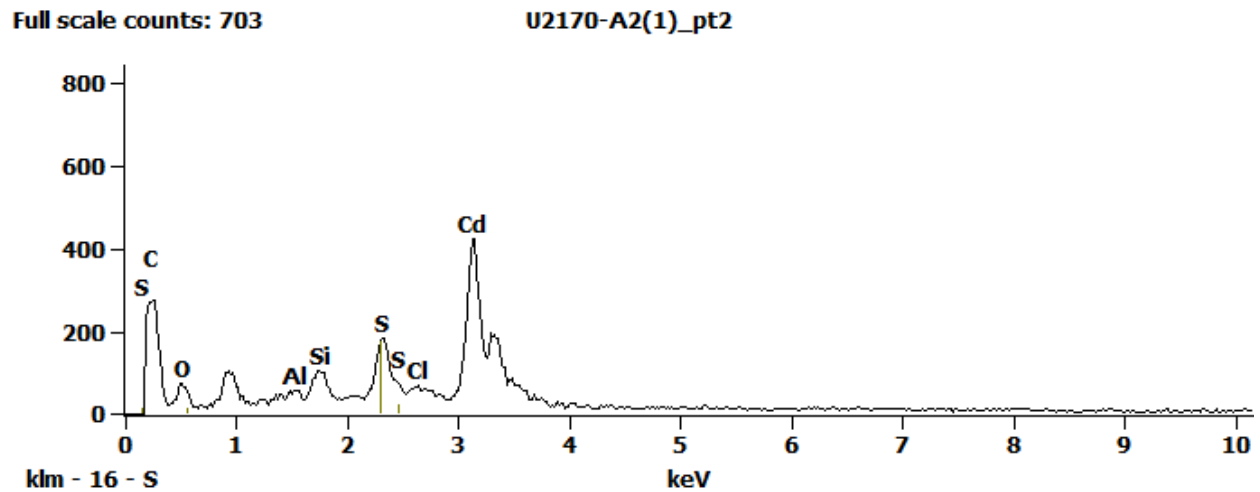


Figure 2. EDS spectra for sample U2170-A2 taken at test area 2. The test area is labeled in the particle SEM photo.

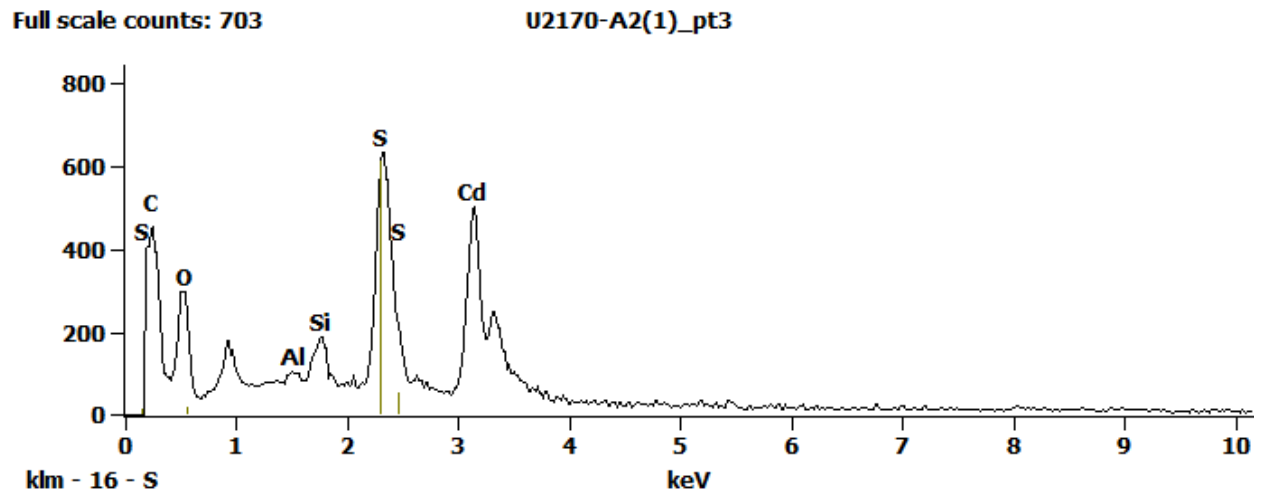
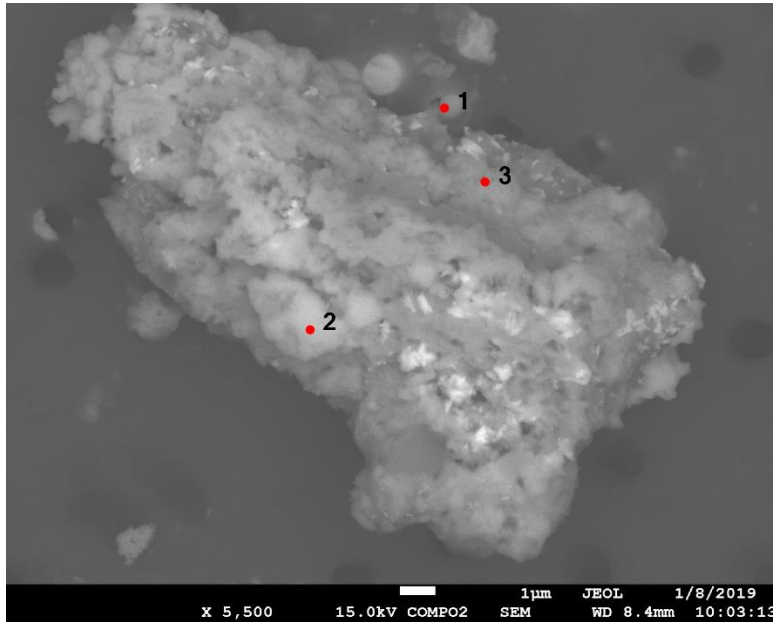


Figure 3. EDS spectra for sample U2170-A2 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A5



Particle Size: 10x15 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 3
Comments:

SEM photo of sample U2170-A5 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 3

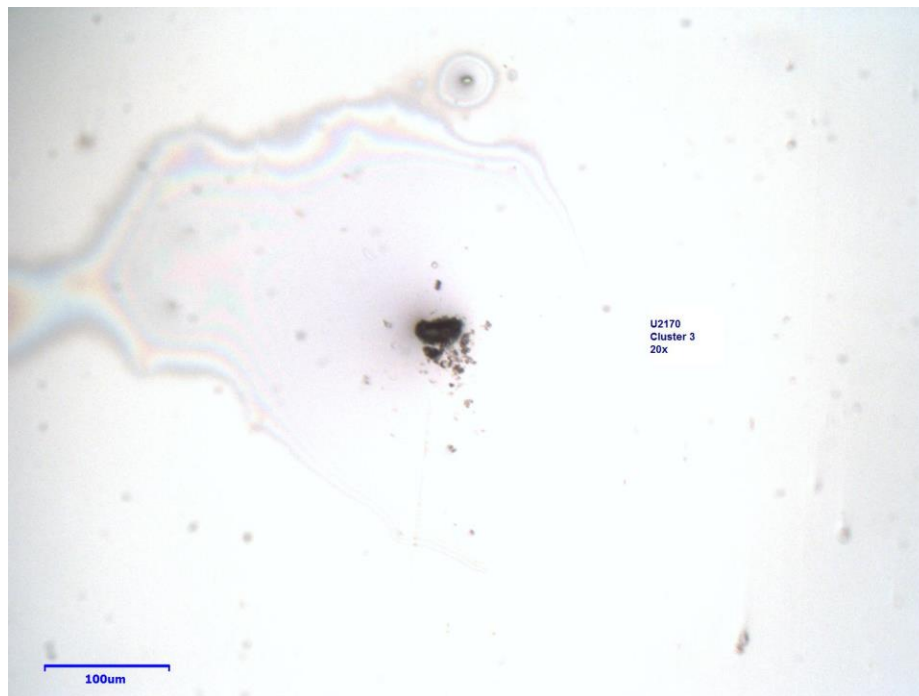


Photo of cluster U2170 Cluster 3.

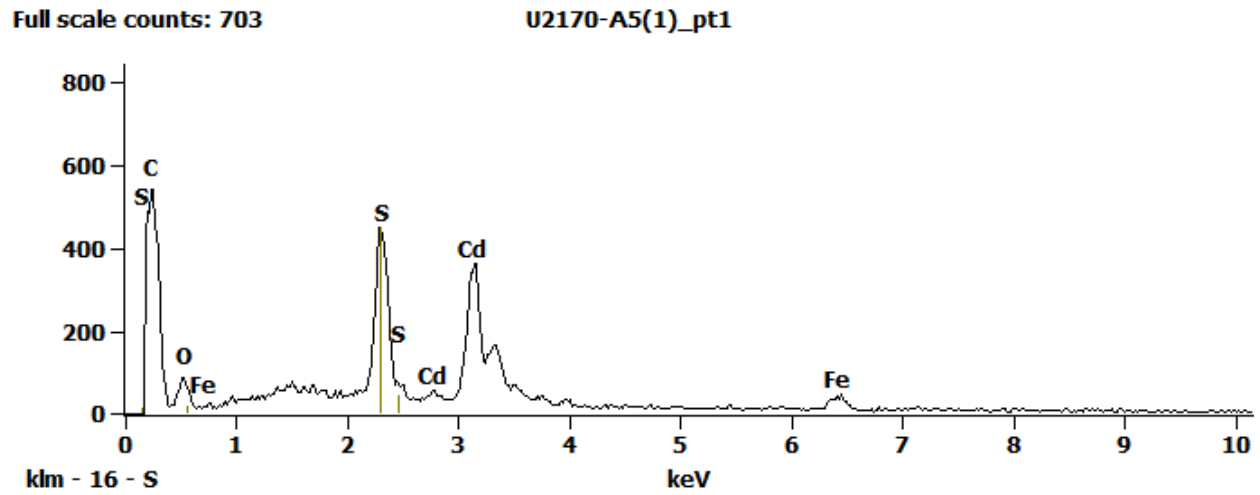
U2170 A5 - EDS Spectra

Figure 1. EDS spectra for sample U2170-A5 taken at test area 1. The test area is labeled in the particle SEM photo.

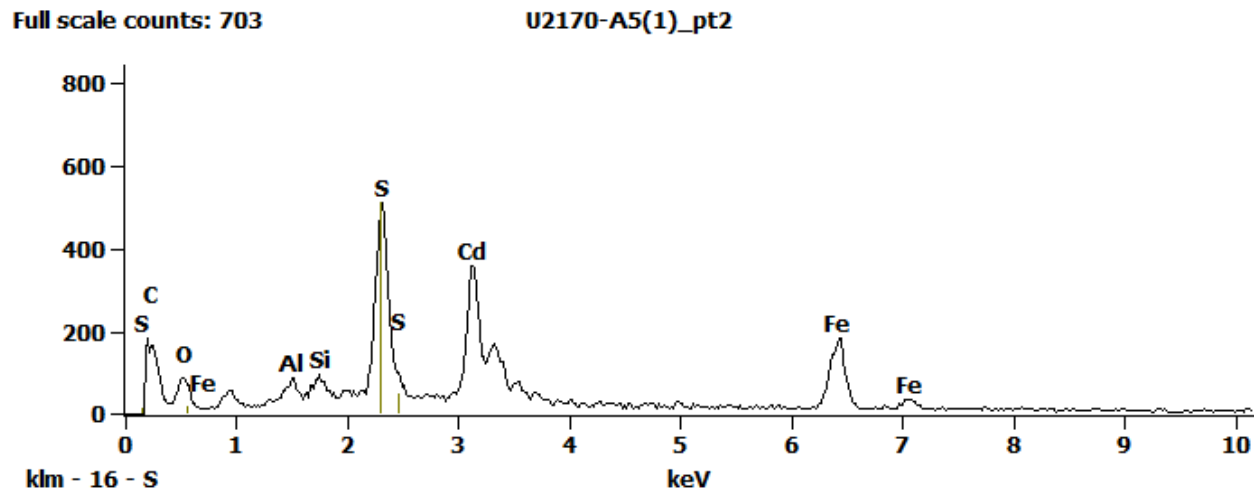


Figure 2. EDS spectra for sample U2170-A5 taken at test area 2. The test area is labeled in the particle SEM photo.

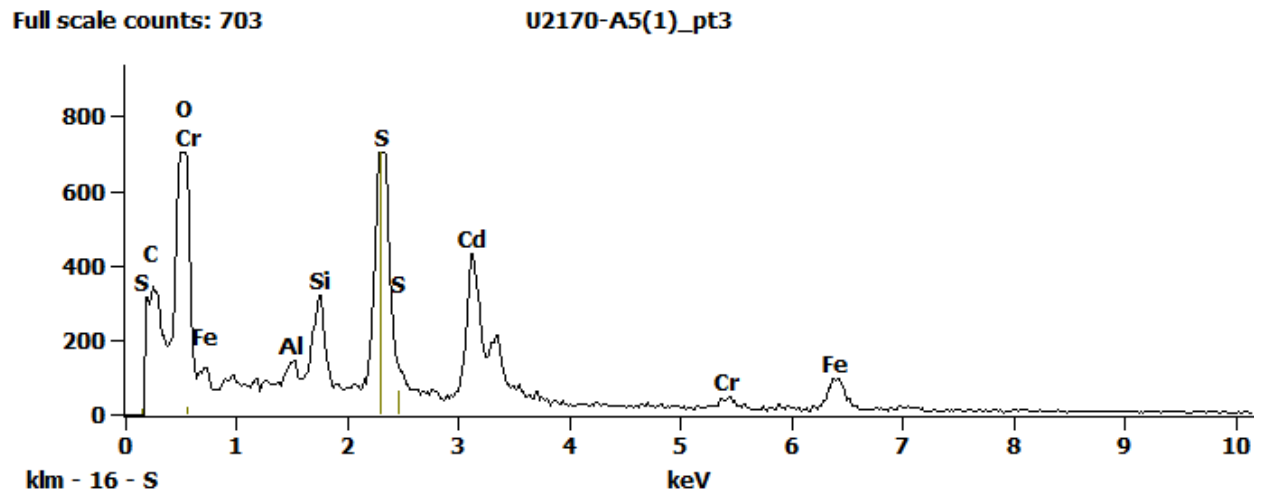
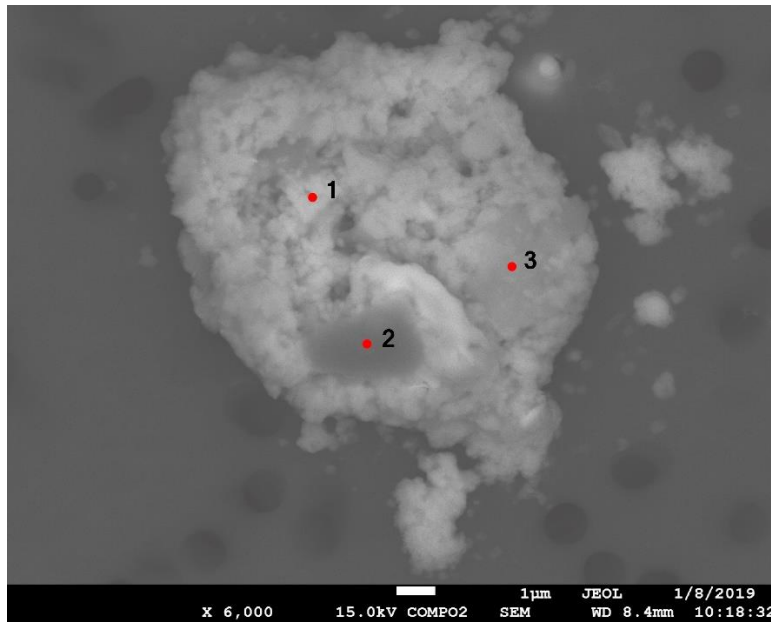


Figure 3. EDS spectra for sample U2170-A5 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A6



SEM photo of sample U2170-A6 with labeled EDS testing locations.

Particle Size:	15 µm
Shape:	Equidimensional
Transparency:	Translucent to Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Subvitreous
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 3
Comments:	

Cluster of Origin: U2170 Cluster 3



Photo of cluster U2170 Cluster 3.

U2170 A6 - EDS Spectra

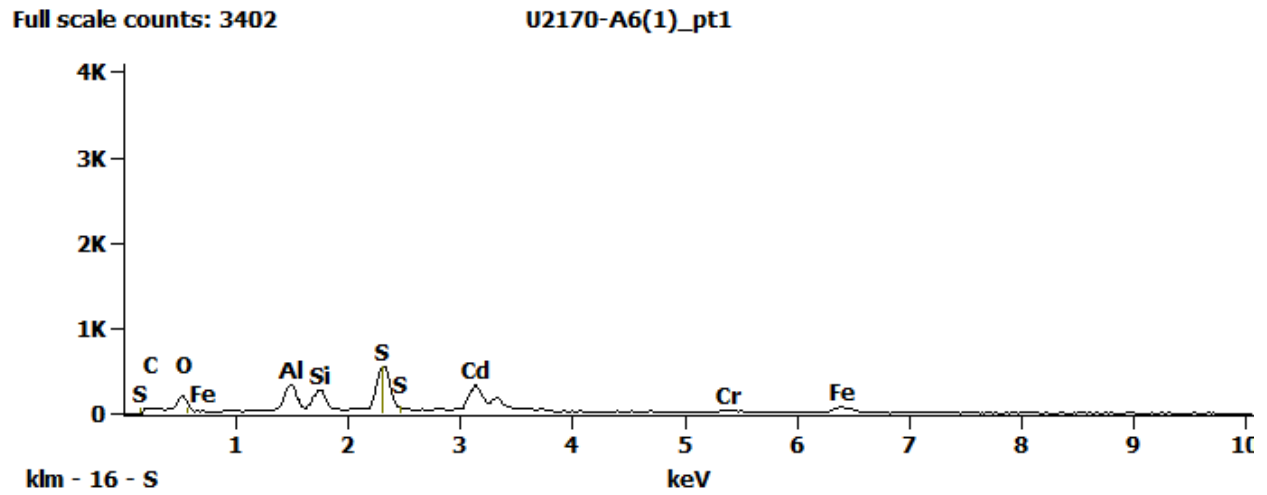


Figure 1. EDS spectra for sample U2170-A6 taken at test area 1. The test area is labeled in the particle SEM photo.

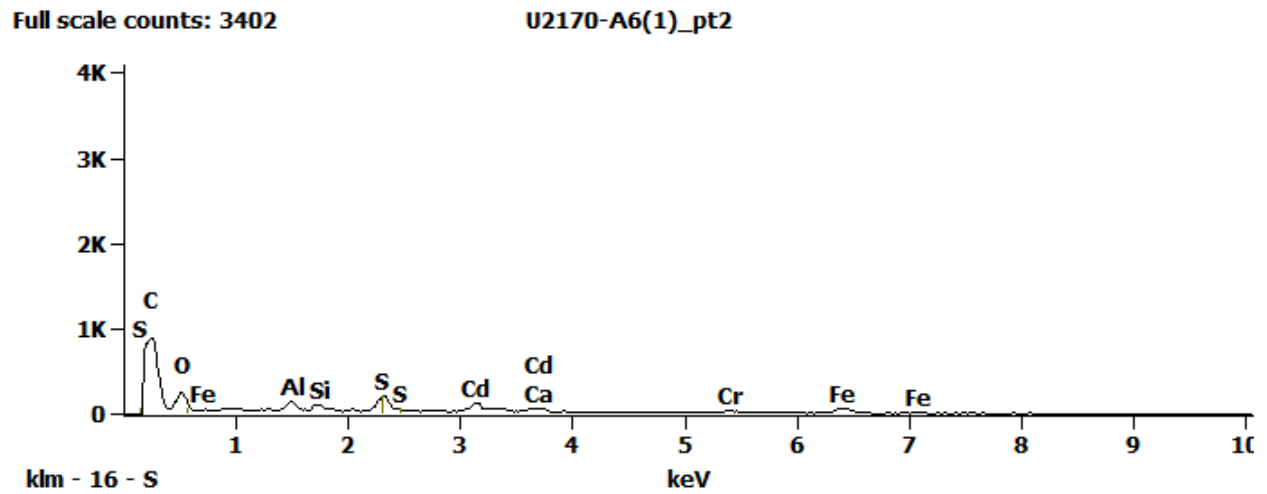


Figure 2. EDS spectra for sample U2170-A6 taken at test area 2. The test area is labeled in the particle SEM photo.

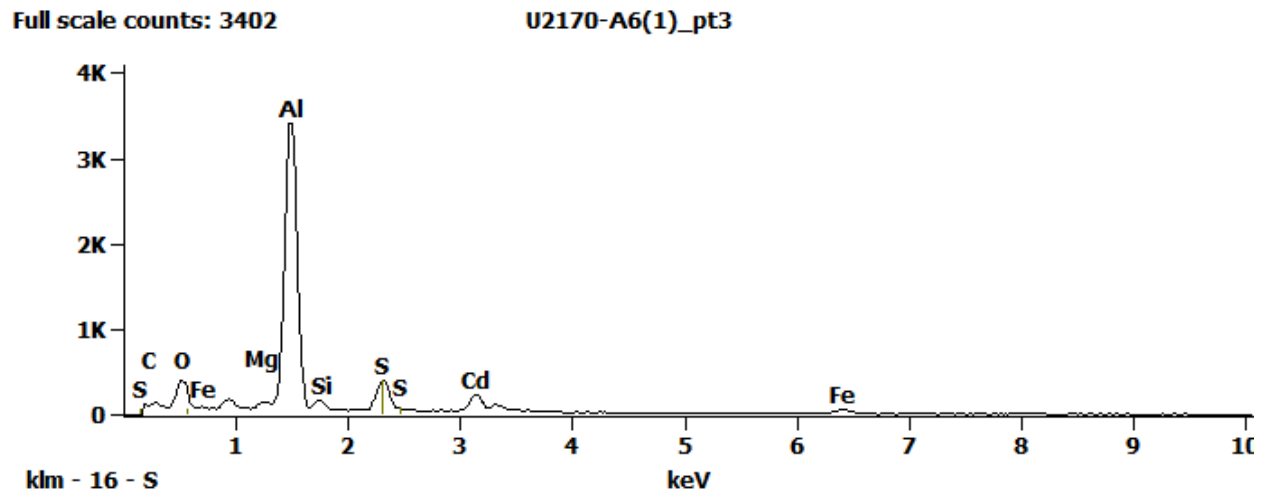
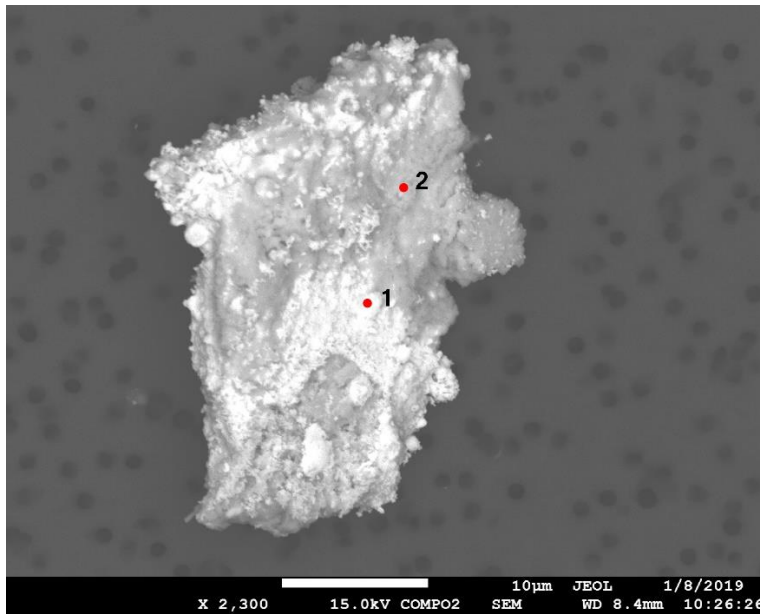


Figure 3. EDS spectra for sample U2170-A6 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A7



Particle Size:	32 x18 μm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 4
Comments:	

SEM photo of sample U2170-A7 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 4

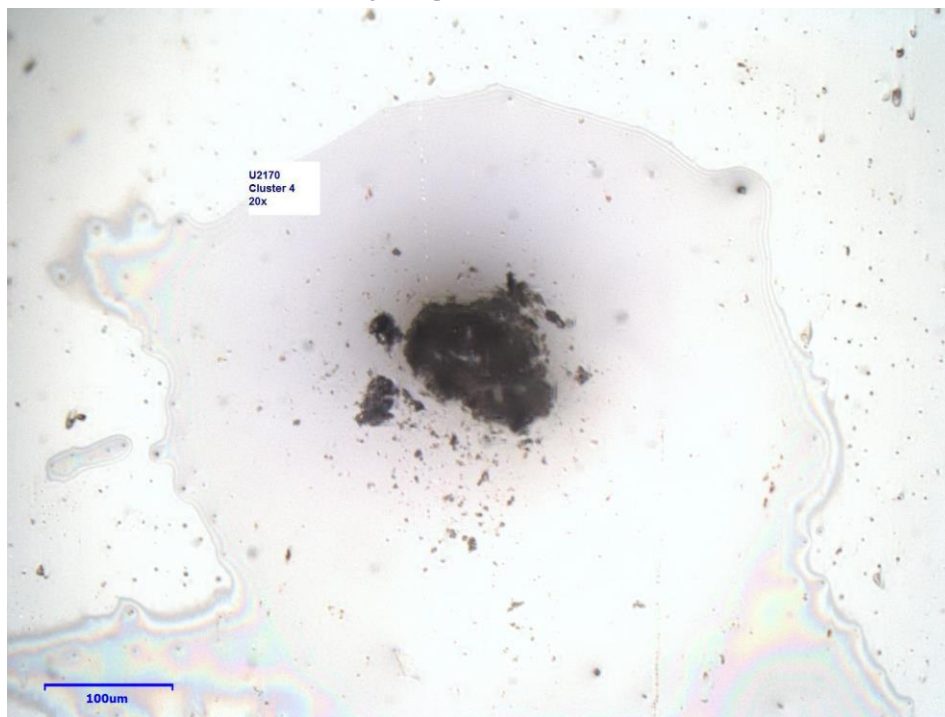


Photo of cluster U2170 Cluster 4.

U2170 A7 - EDS Spectra

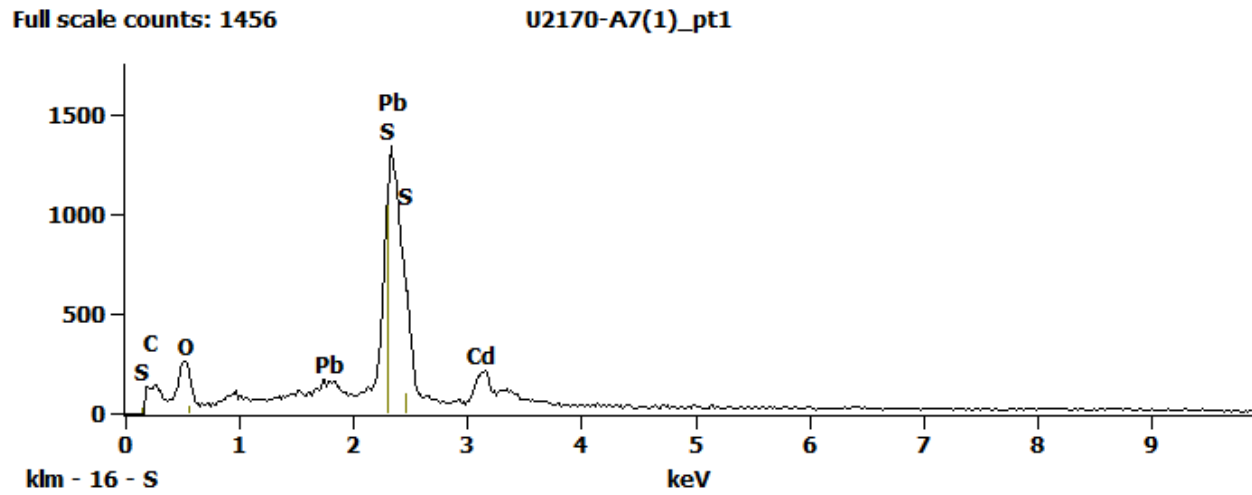


Figure 1. EDS spectra for sample U2170-A7 taken at test area 1. The test area is labeled in the particle SEM photo.

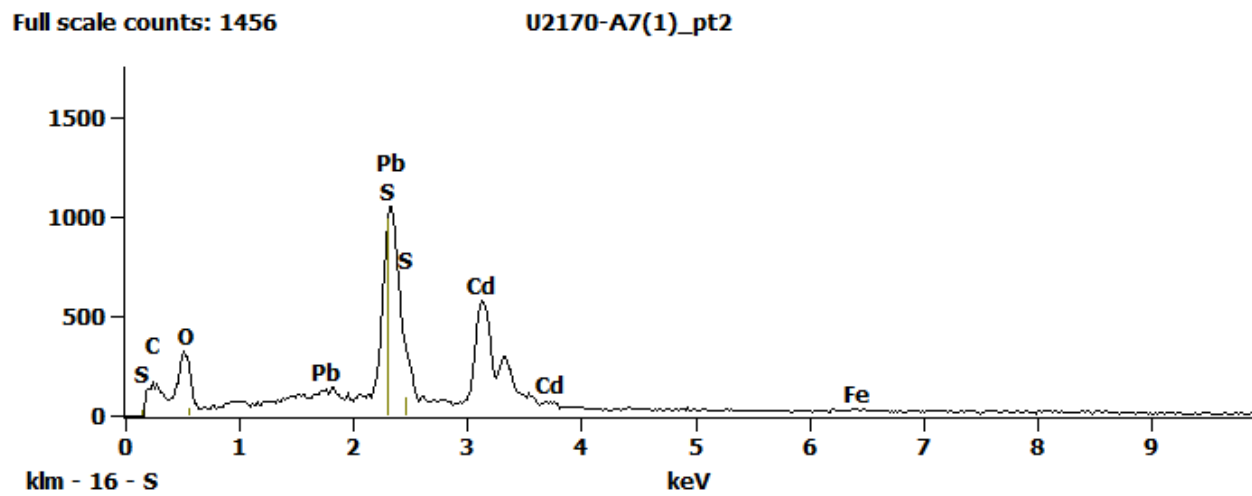
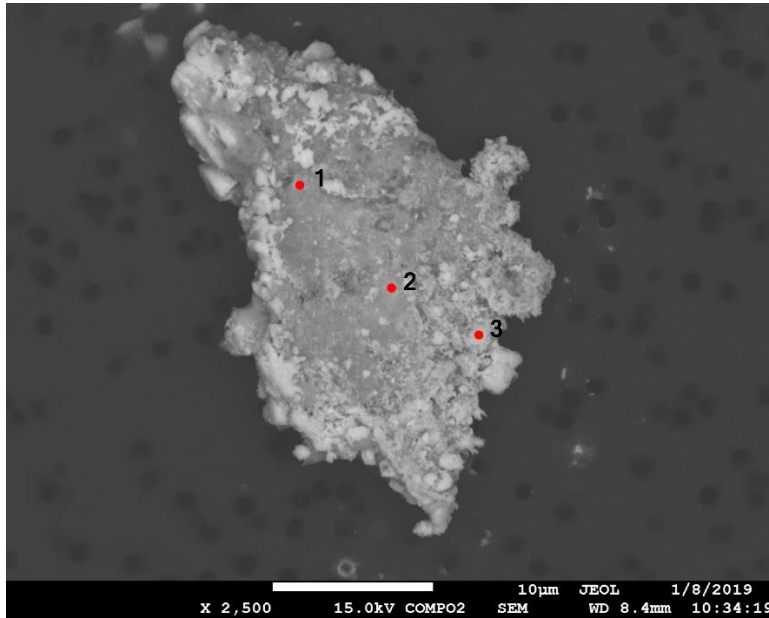


Figure 2. EDS spectra for sample U2170-A7 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 A8



Particle Size:	30 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 4
Comments:	

SEM photo of sample U2170-A8 with labeled EDS testing locations..

Cluster of Origin: U2170 Cluster 4

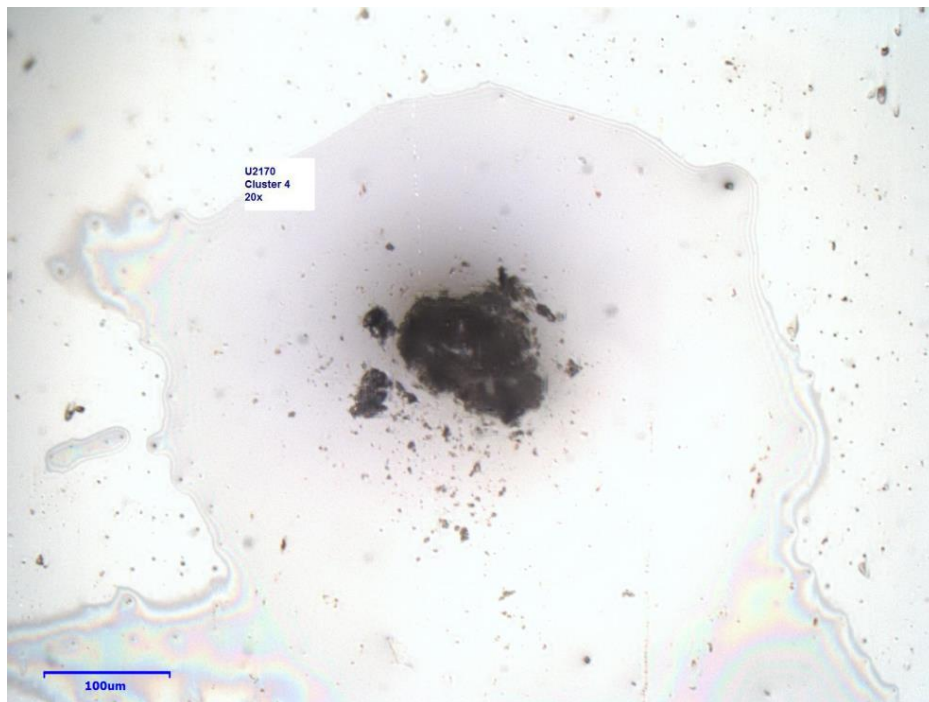


Photo of cluster U2170 Cluster 4.

U2170 A8 - EDS Spectra

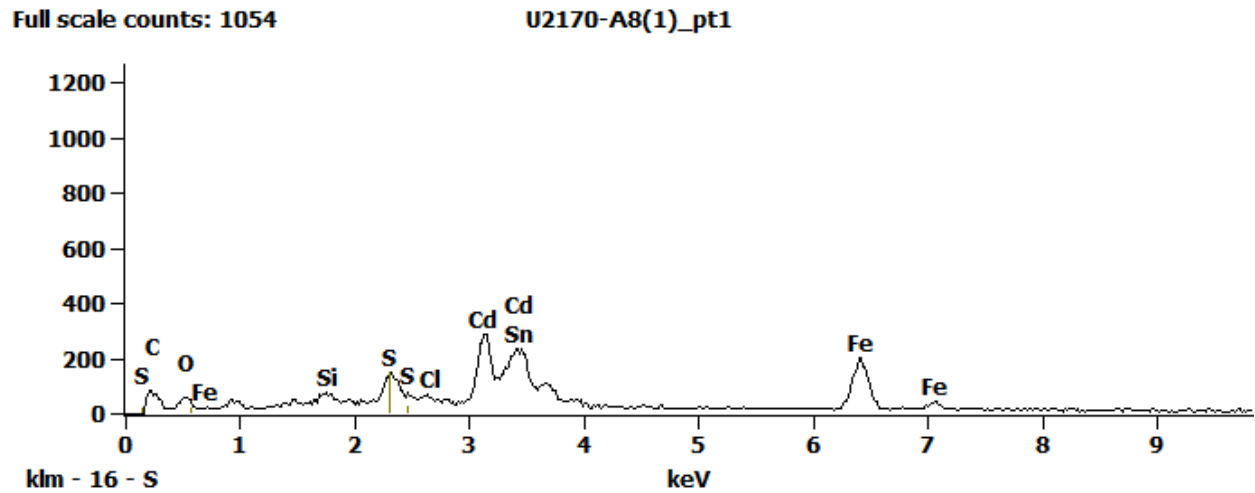


Figure 1. EDS spectra for sample U2170-A8 taken at test area 1. The test area is labeled in the particle SEM photo.

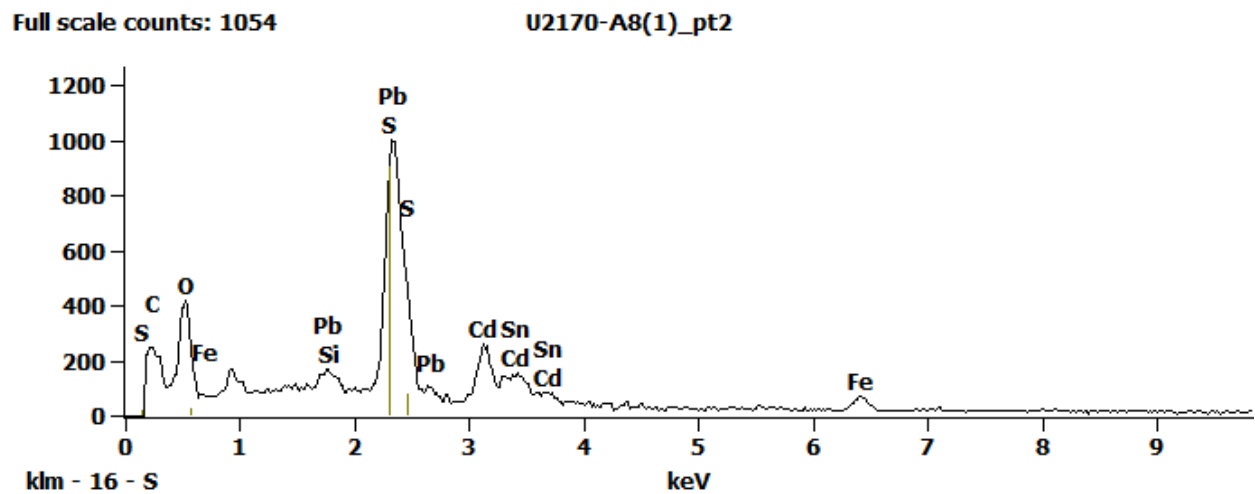


Figure 2. EDS spectra for sample U2170-A8 taken at test area 2. The test area is labeled in the particle SEM photo.

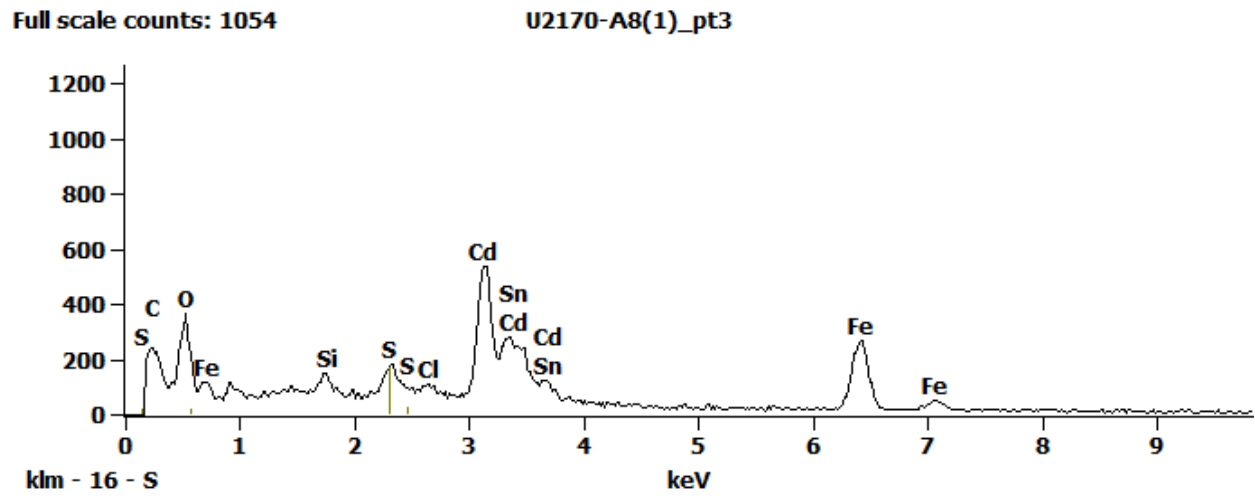
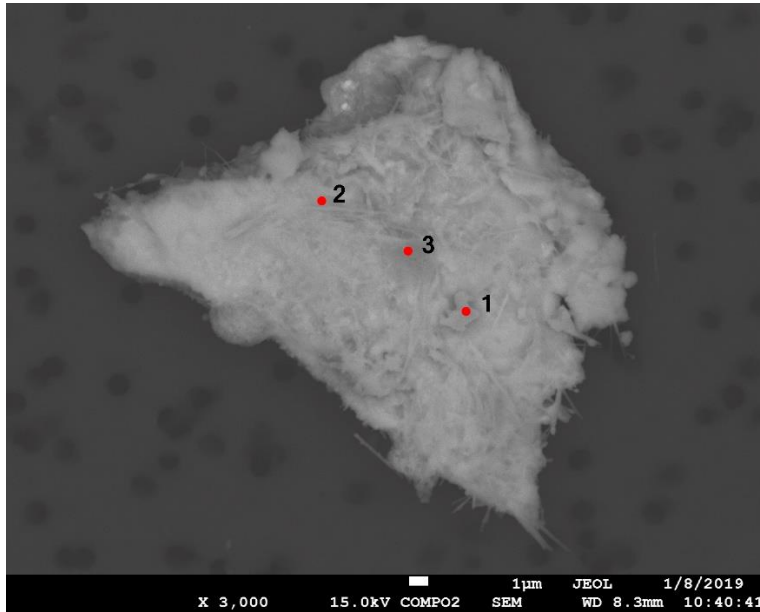


Figure 3. EDS spectra for sample U2170-A8 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A9



Particle Size: 30 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 5
Comments:

SEM photo of sample U2170-A9 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 5



Photo of cluster U2170 Cluster 5

U2170 A9 - EDS Spectra

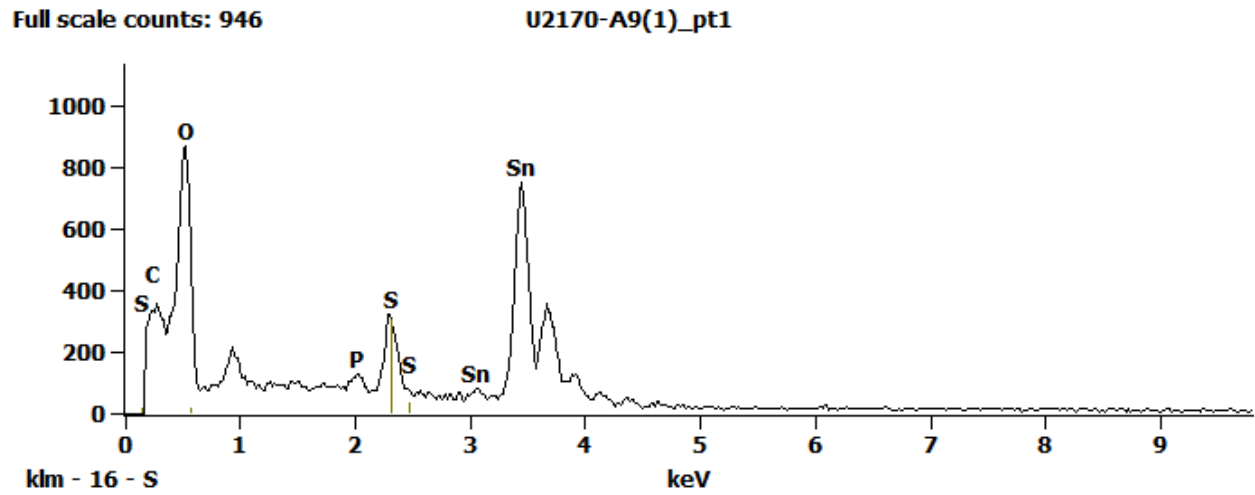


Figure 1. EDS spectra for sample U2170-A9 taken at test area 1. The test area is labeled in the particle SEM photo.

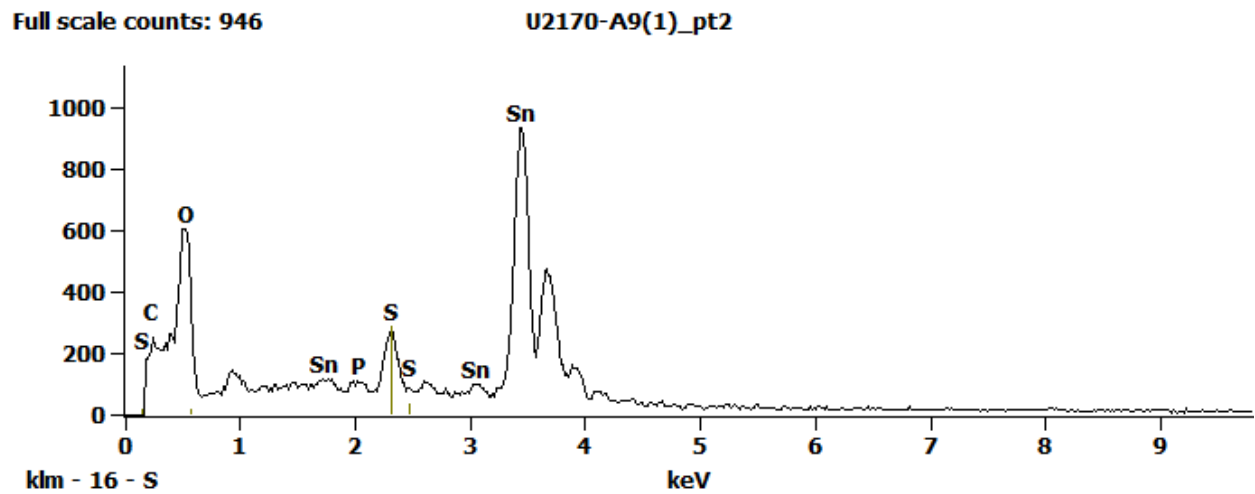


Figure 2. EDS spectra for sample U2170-A9 taken at test area 2. The test area is labeled in the particle SEM photo.

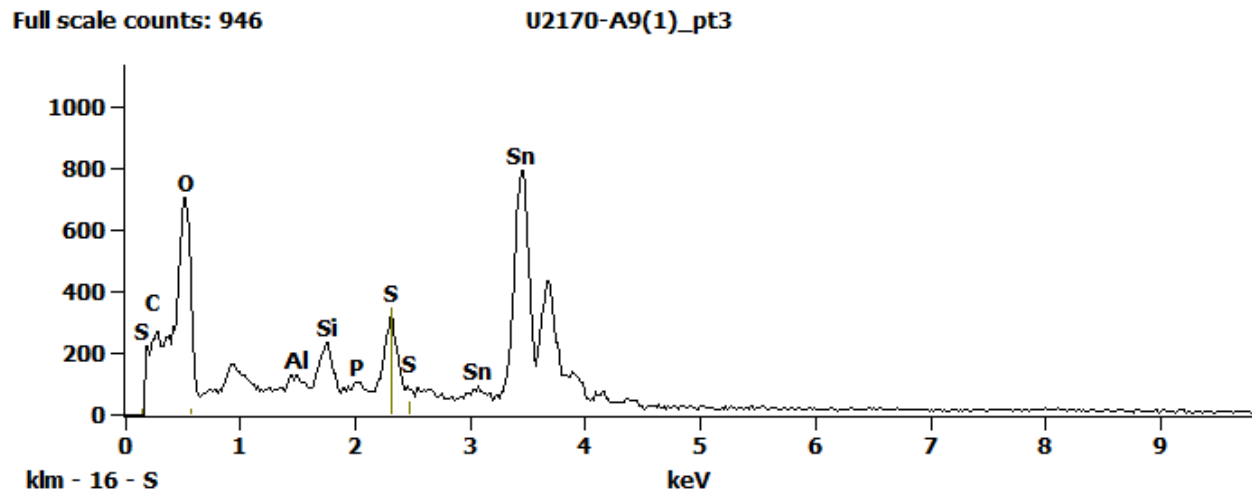
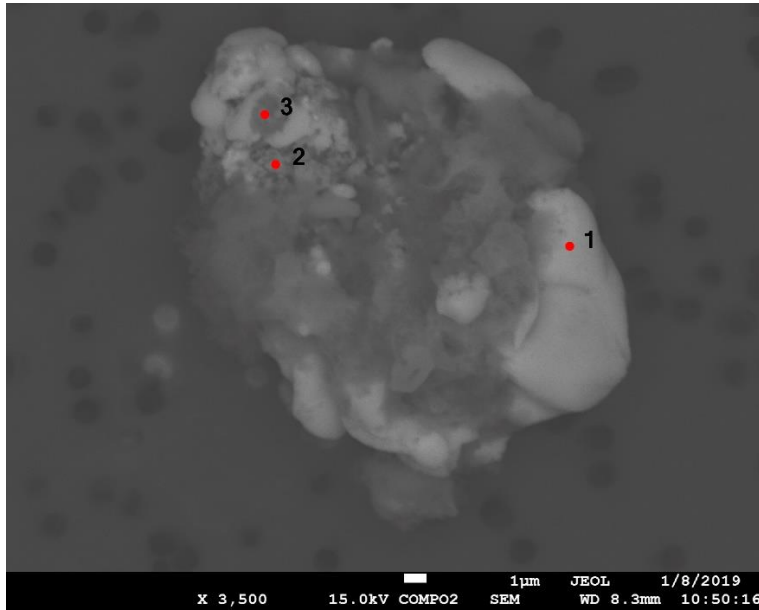


Figure 3. spectra for sample U2170-A9 taken at test area 3. The test area is labeled in the particle SEM photo..

U2170 A11



Particle Size:	15 µm
Shape:	Equidimensional
Transparency:	Translucent to Opaque
Color:	GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 6
Comments:	

SEM photo of sample U2170-A11 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 6



Photo of cluster U2170 Cluster 6

U2170 A11 - EDS Spectra

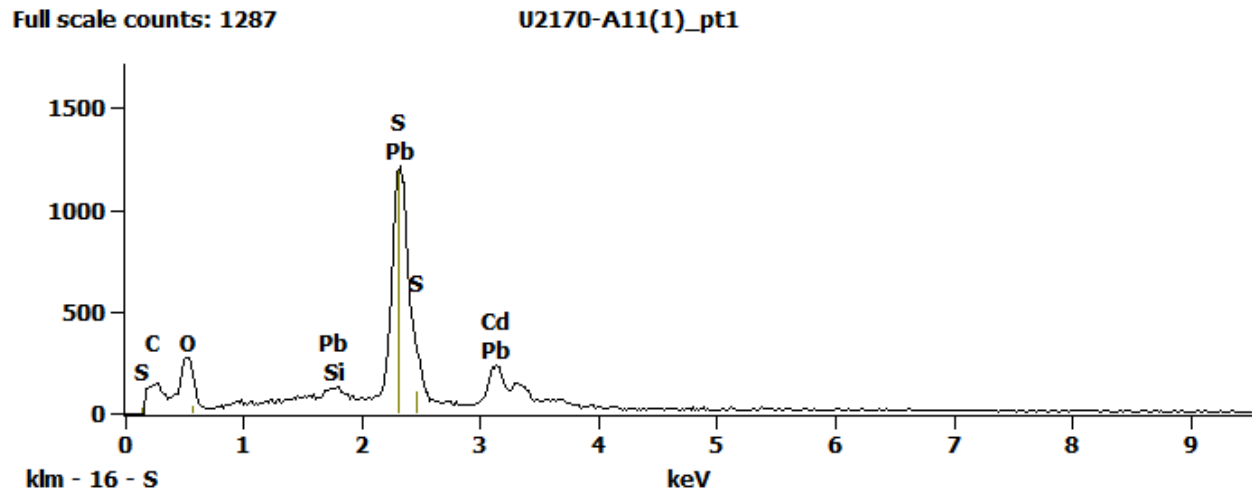


Figure 1. EDS spectra for sample U2170-A11 taken at test area 1. The test area is labeled in the particle SEM photo.

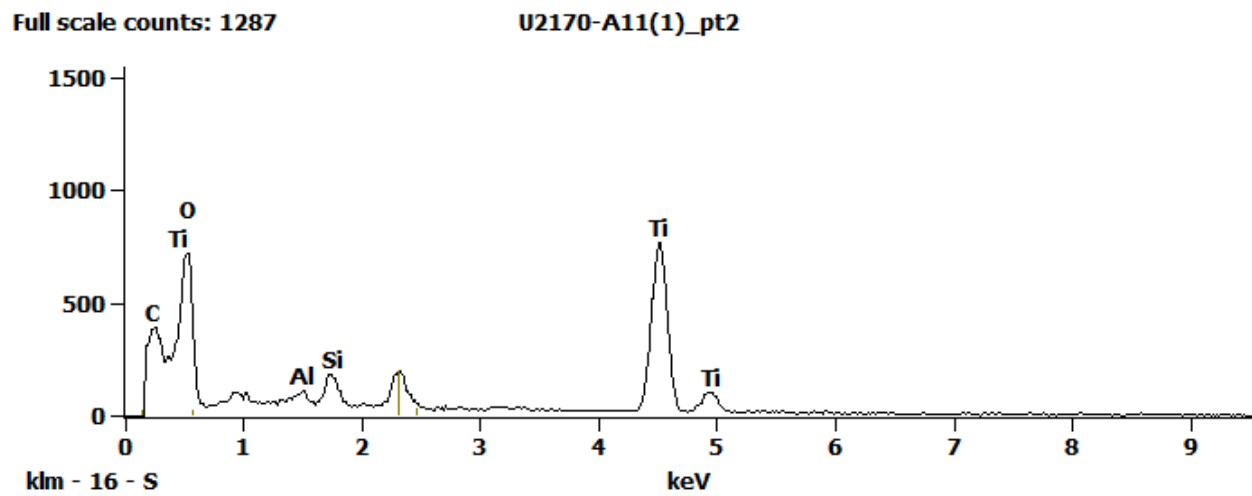


Figure 2. EDS spectra for sample U2170-A11 taken at test area 2. The test area is labeled in the particle SEM photo.

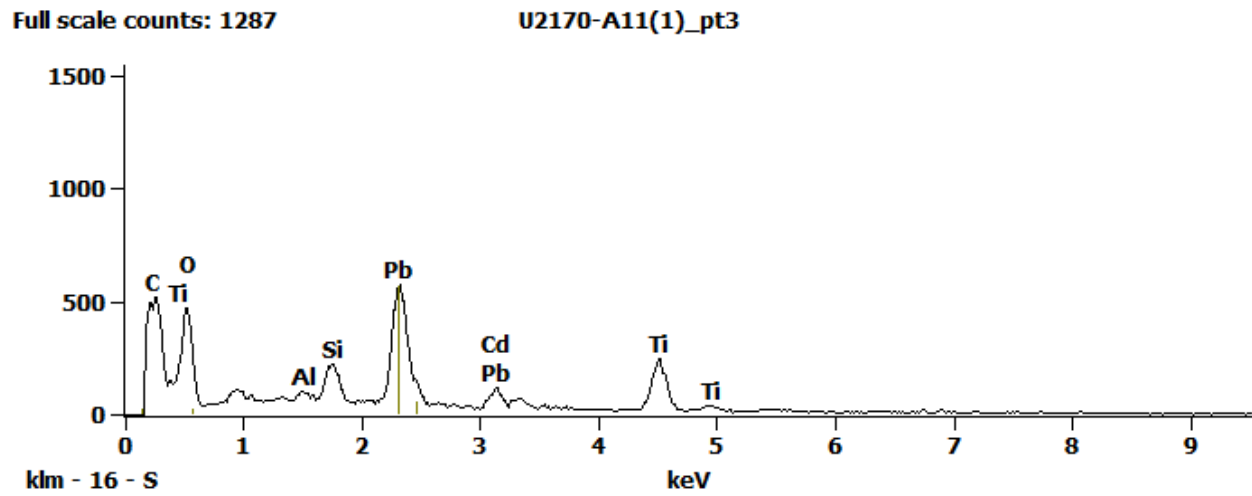
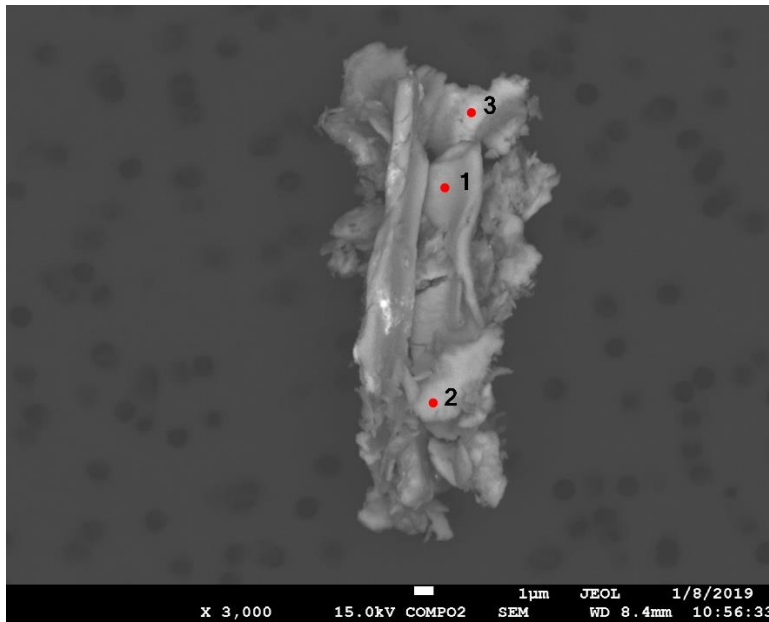


Figure 3. EDS spectra for sample U2170-A11 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A12



Particle Size: 8 µm
Shape: Equidimensional
Transparency: Translucent to Opaque
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 6
Comments:

SEM photo of sample U2170-A12 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 6



Photo of cluster U2170 Cluster 6

U2170 A12 - EDS Spectra

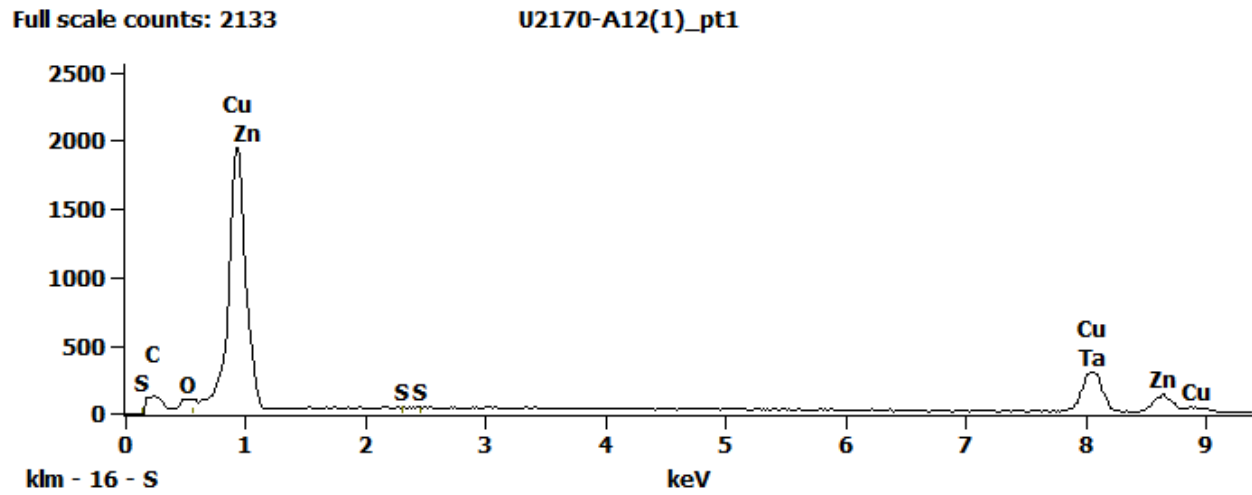


Figure 1. EDS spectra for sample U2170-A12 taken at test area 1. The test area is labeled in the particle SEM photo.

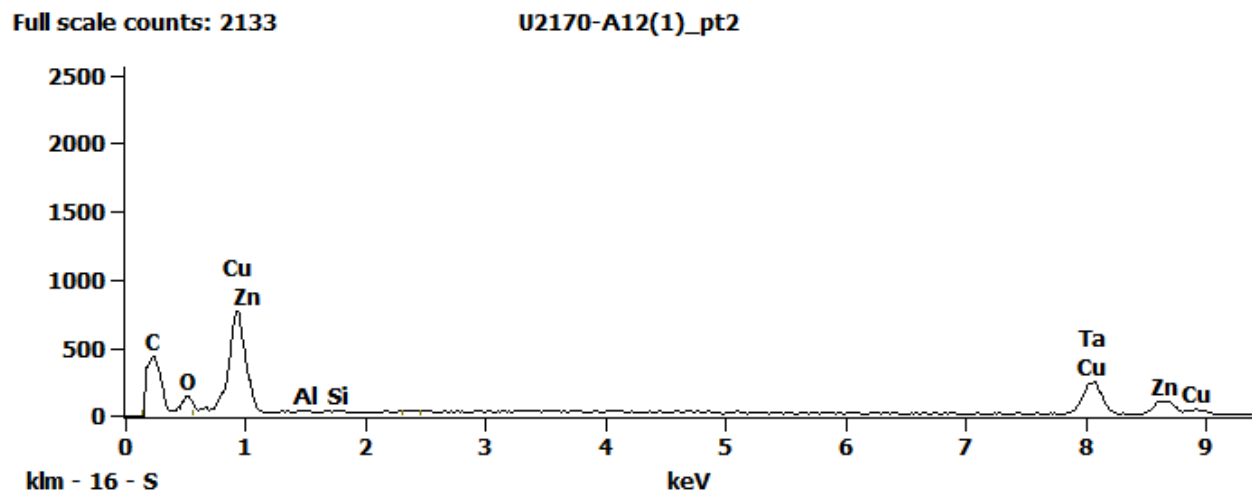


Figure 2. EDS spectra for sample U2170-A12 taken at test area 2. The test area is labeled in the particle SEM photo.

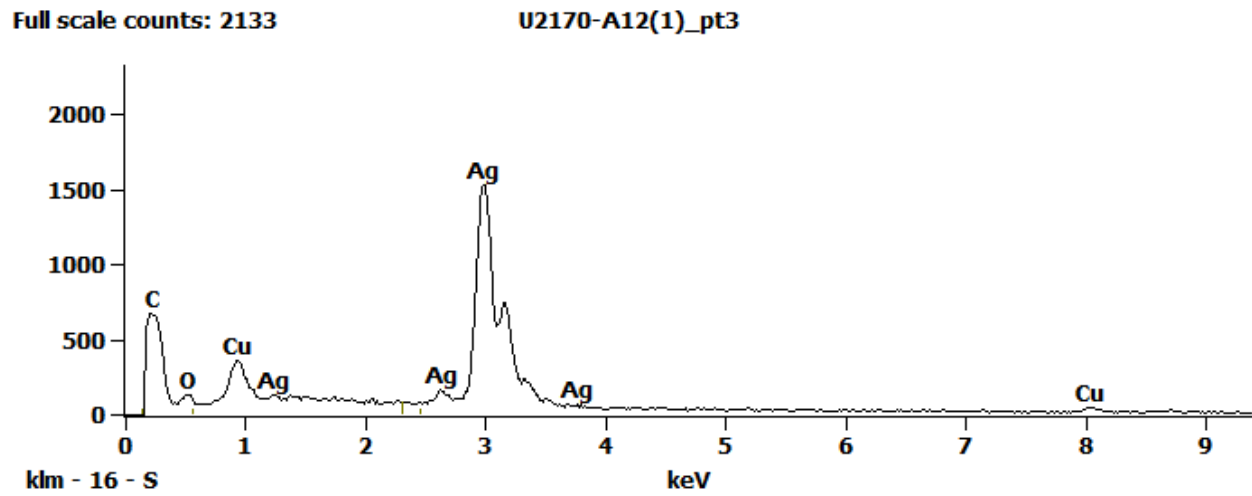
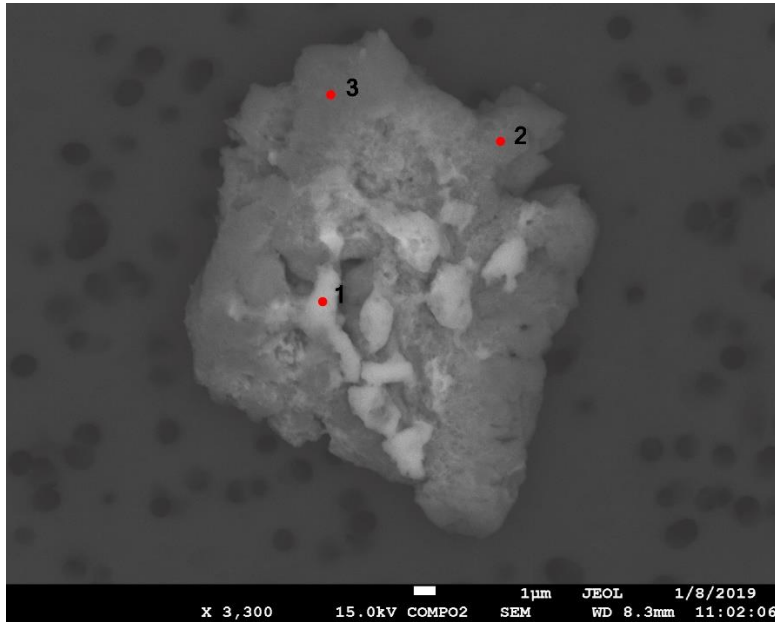


Figure 3. EDS spectra for sample U2170-A12 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A13



Particle Size: 20 µm
Shape: Equidimensional
Transparency: Transparent to Opaque
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 7
Comments:

SEM photo of sample U2170-A13 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 7

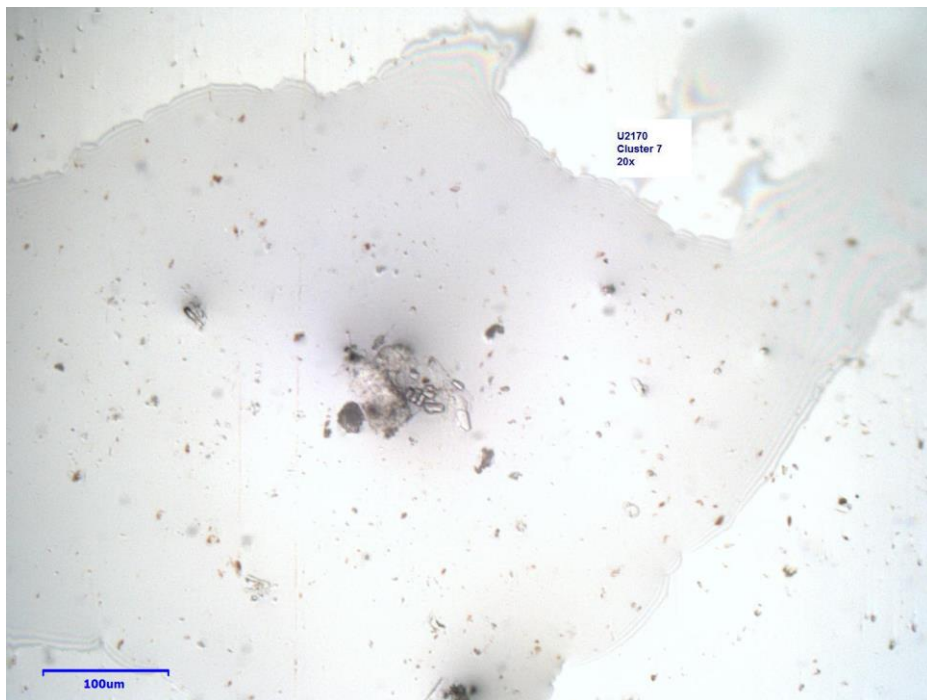


Photo of cluster U2170 Cluster 7

U2170 A13 - EDS Spectra

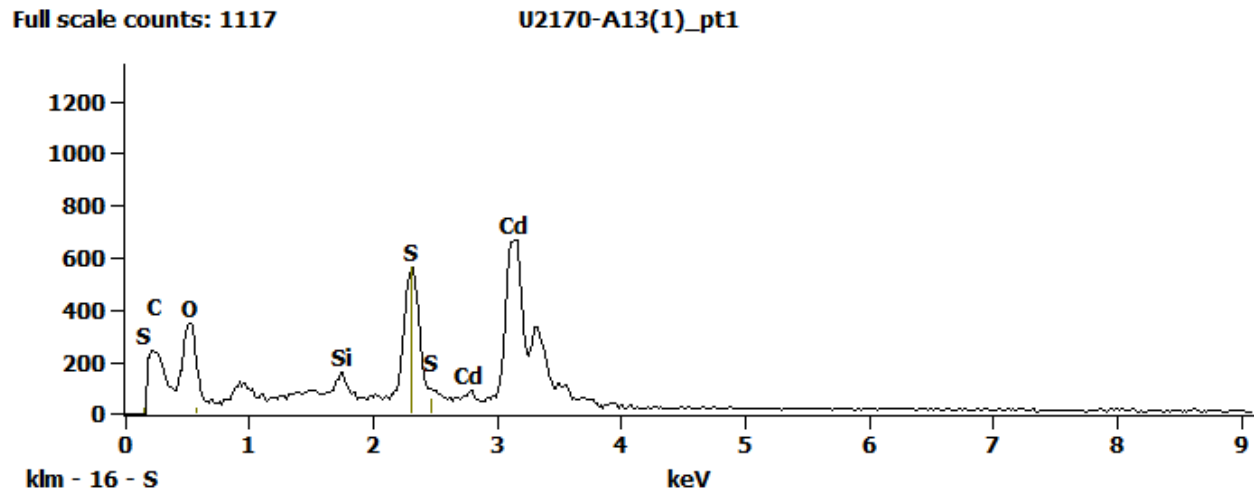


Figure 1. EDS spectra for sample U2170-A13 taken at test area 1. The test area is labeled in the particle SEM photo.

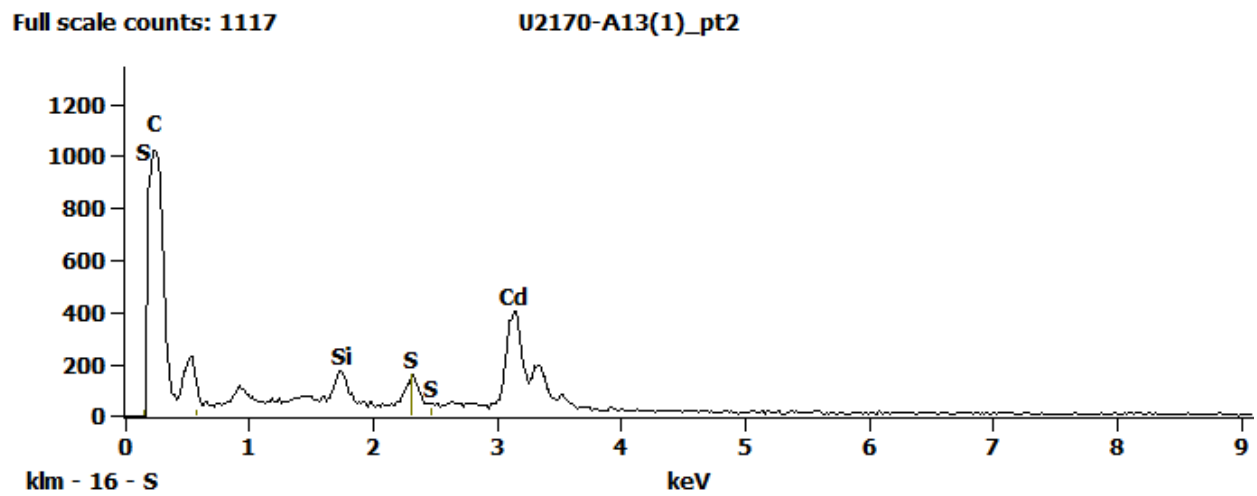


Figure 2. EDS spectra for sample U2170-A13 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 1117

U2170-A13(1)_pt3

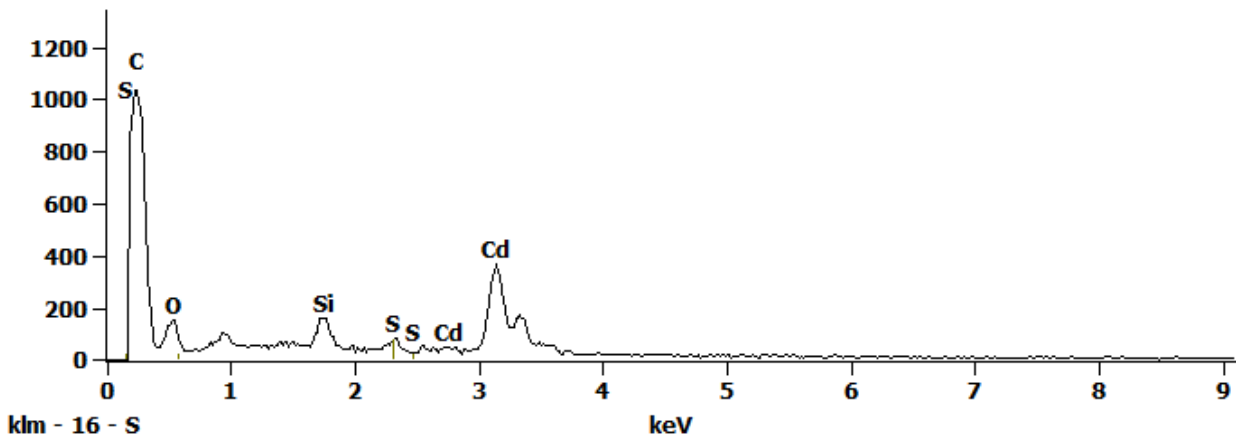
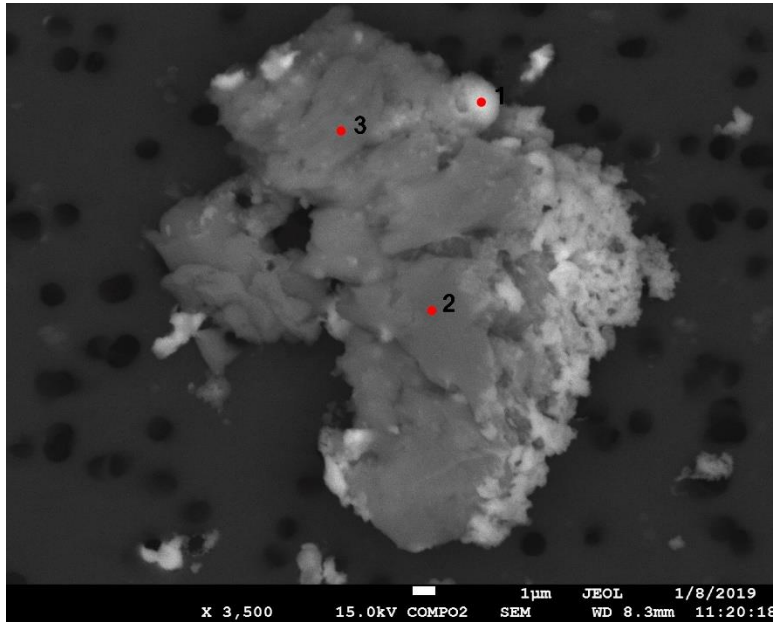


Figure 3. EDS spectra for sample U2170-A13 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A15



Particle Size: 22 µm
Shape: Irregular
Transparency: Translucent to Opaque
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 8
Comments:

SEM photo of sample U2170-A15 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 8

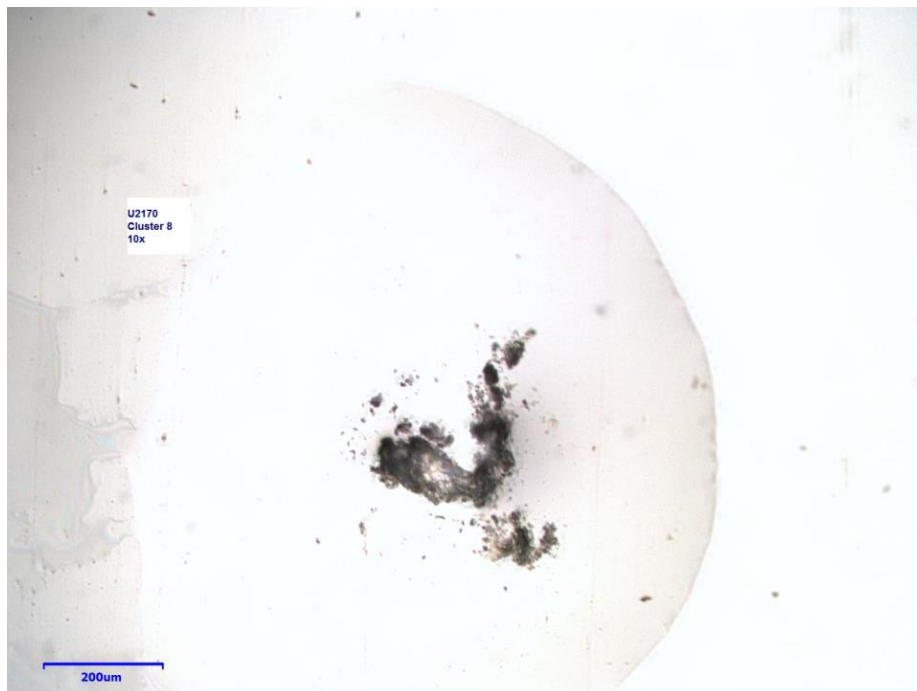


Photo of cluster U2170 Cluster 8

U2170 A15 - EDS Spectra

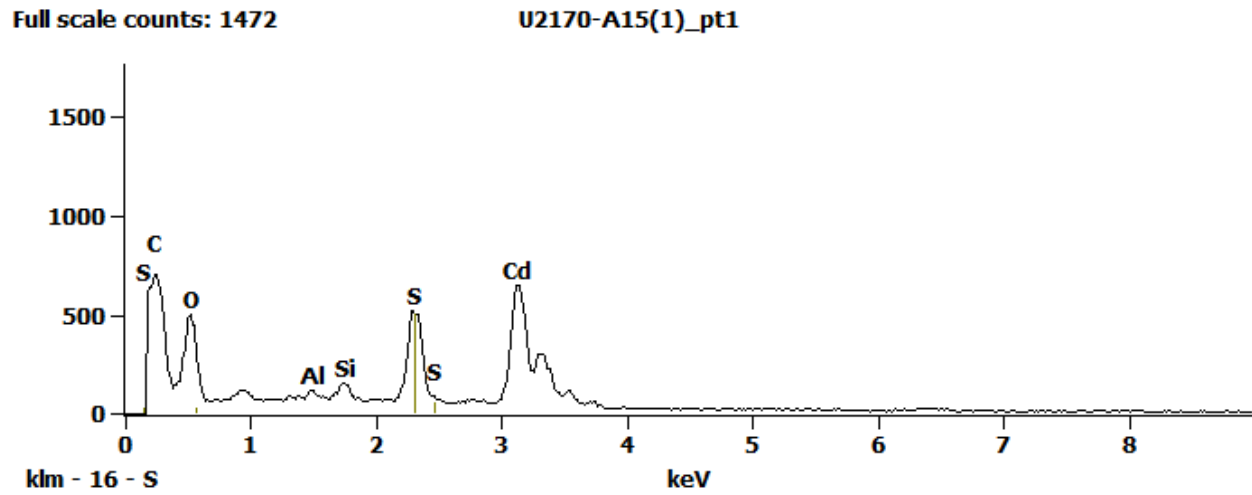


Figure 1. EDS spectra for sample U2170-A15 taken at test area 1. The test area is labeled in the particle SEM photo.

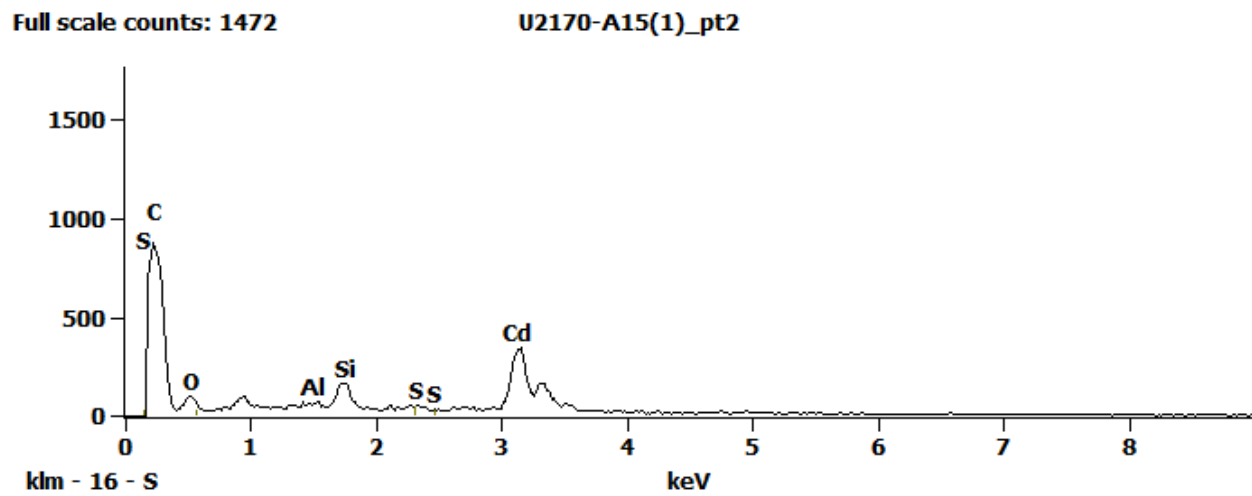


Figure 2. EDS spectra for sample U2170-A15 taken at test area 2. The test area is labeled in the particle SEM photo.

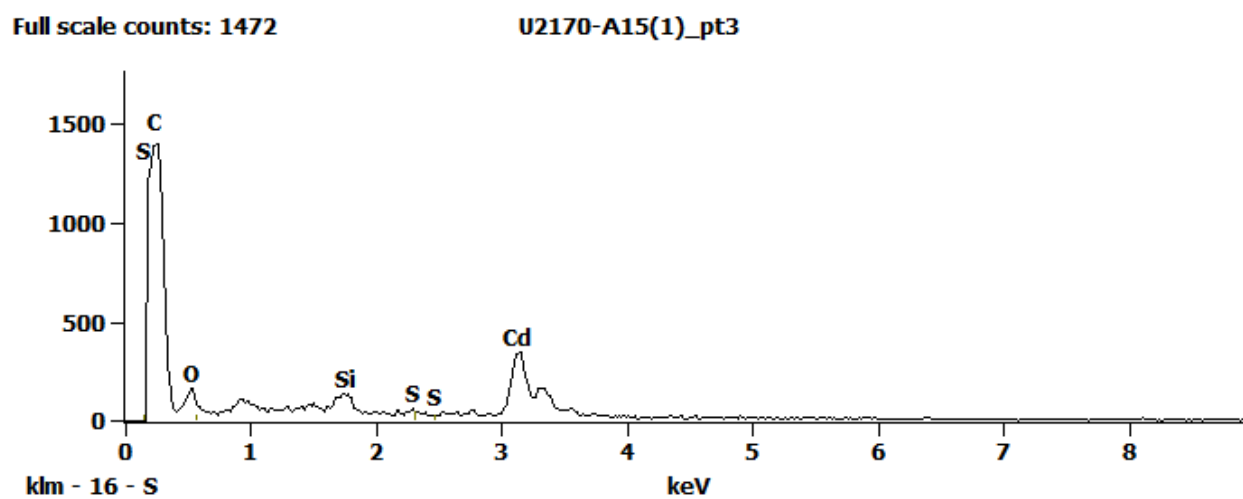
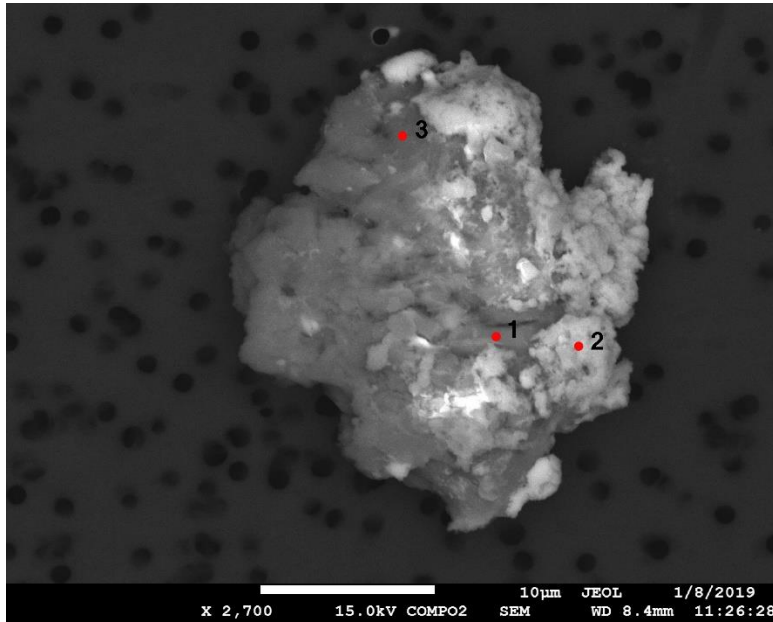


Figure 3. EDS spectra for sample U2170-A15 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 A16



Particle Size: 25 µm
Shape: Equidimensional
Transparency: Translucent to Opaque
Color: GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 8
Comments:

SEM photo of sample U2170-A16 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 8

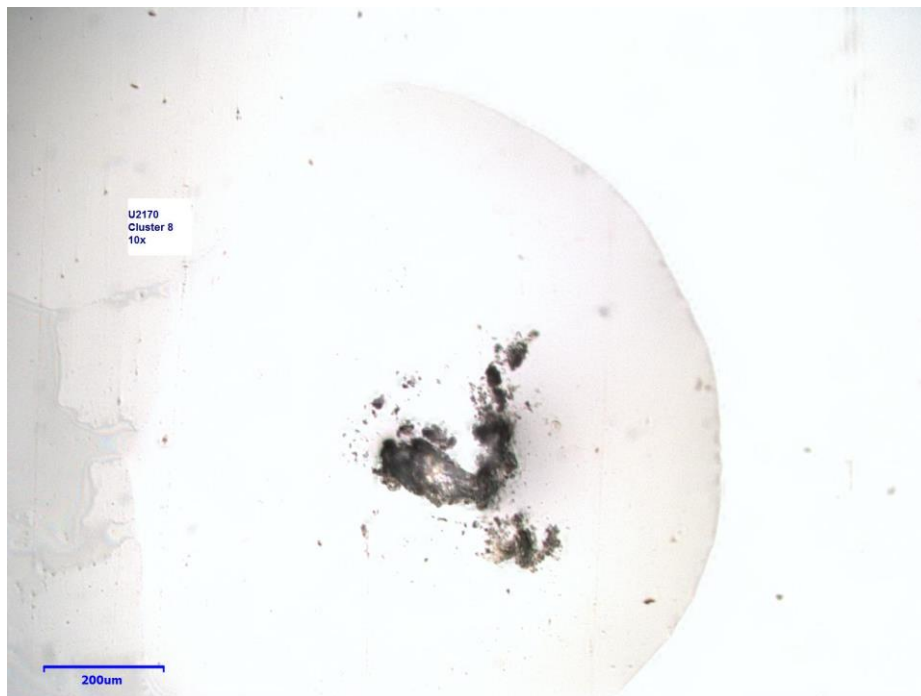


Photo of cluster U2170 Cluster 8.

U2170 A16 - EDS Spectra

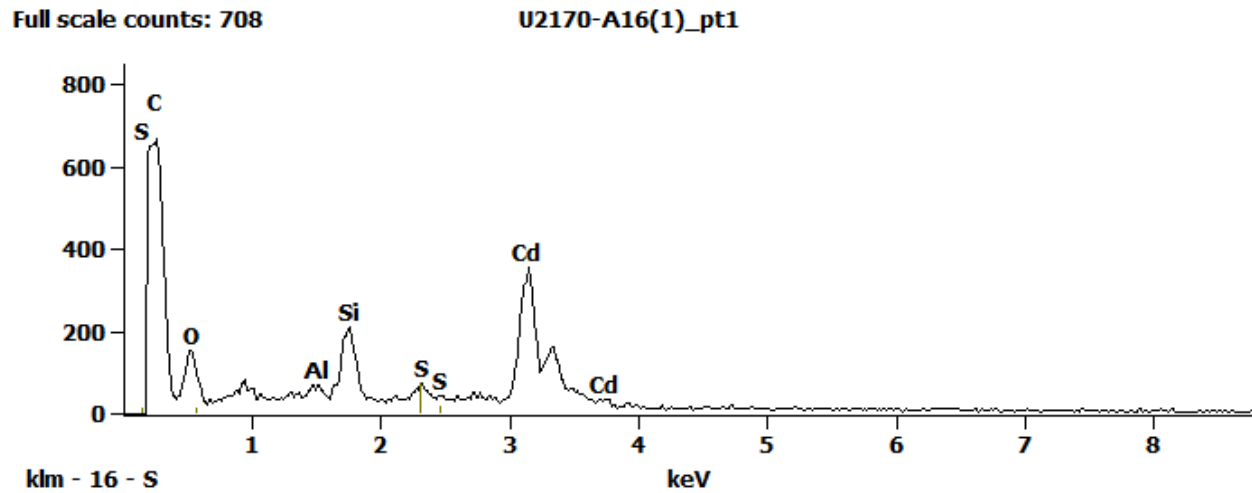


Figure 1. EDS spectra for sample U2170-A16 taken at test area 1. The test area is labeled in the particle SEM photo.

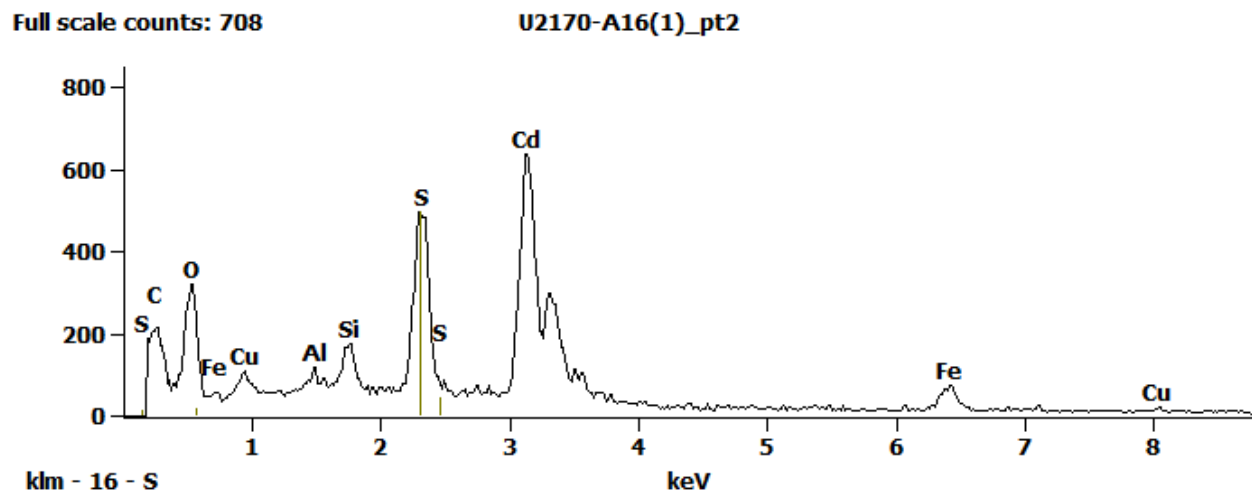


Figure 2. EDS spectra for sample U2170-A16 taken at test area 2. The test area is labeled in the particle SEM photo.

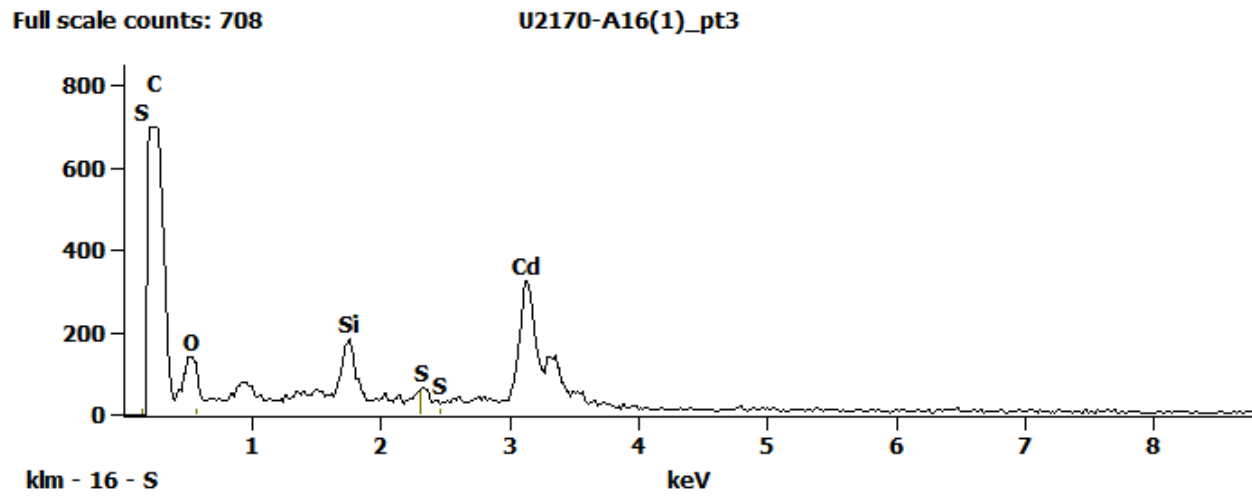
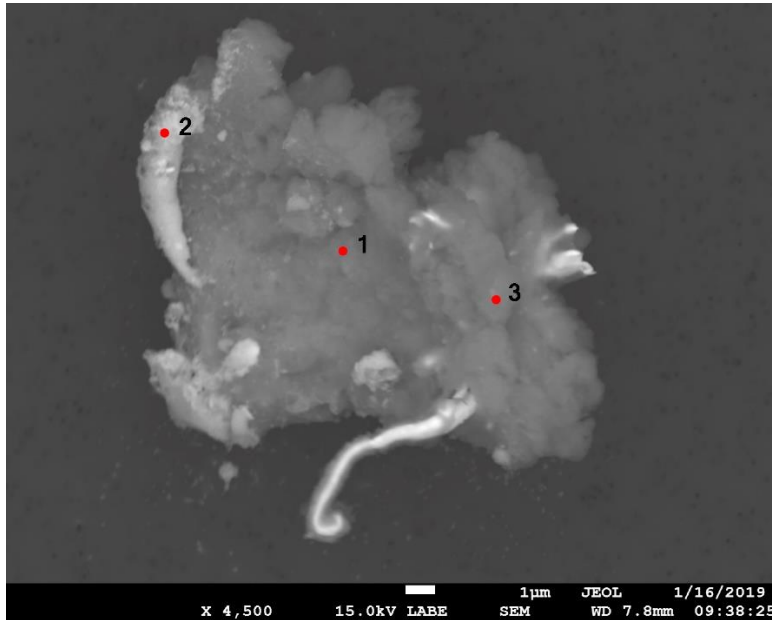


Figure 3. EDS spectra for sample U2170-A16 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 B1



Particle Size:	20 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	CLEAR, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 9
Comments:	

SEM photo of sample U2170-B1 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 9

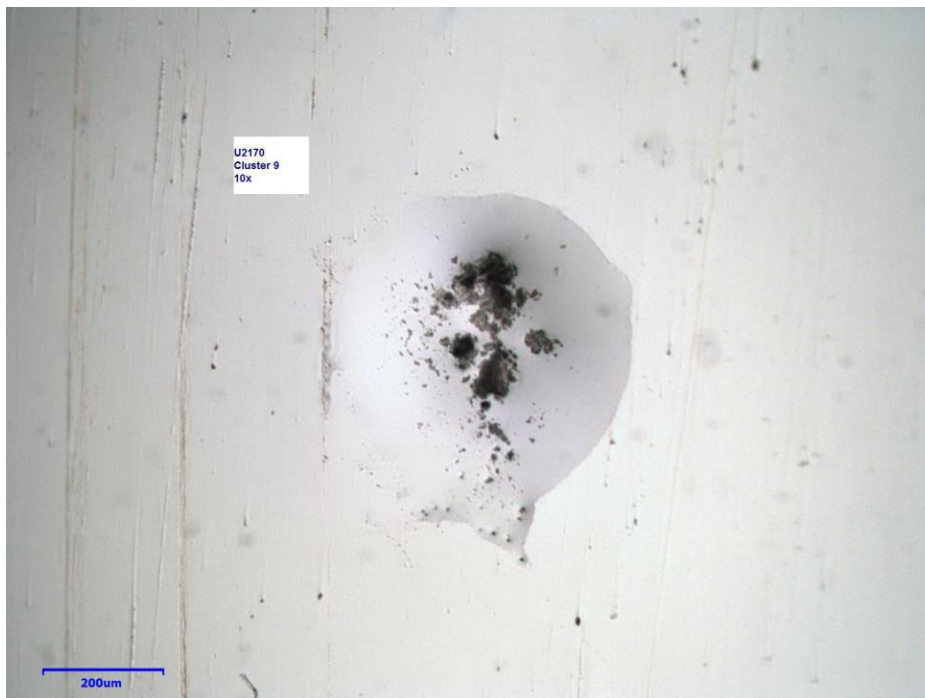


Photo of cluster U2170 Cluster 9.

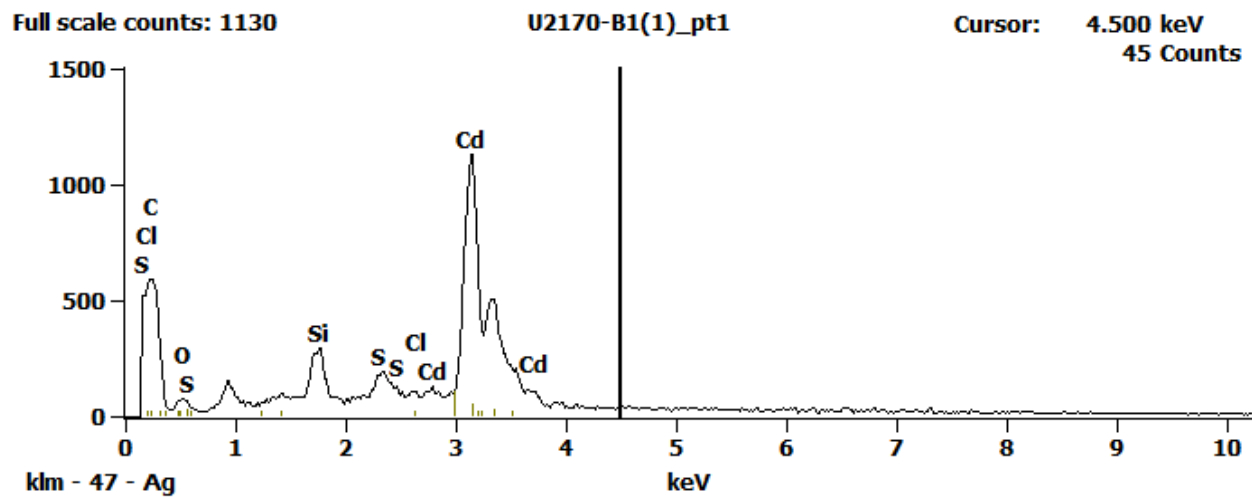
U2170 B1 - EDS Spectra

Figure 1. EDS spectra for sample U2170-B1 taken at test area 1. The test area is labeled in the particle SEM photo.

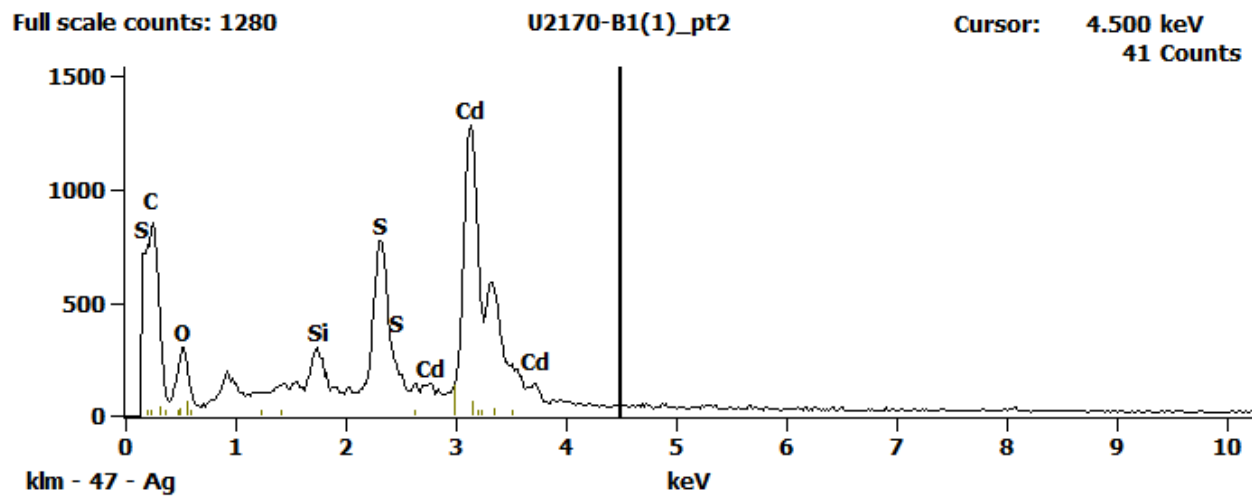


Figure 2. EDS spectra for sample U2170-B1 taken at test area 2. The test area is labeled in the particle SEM photo.

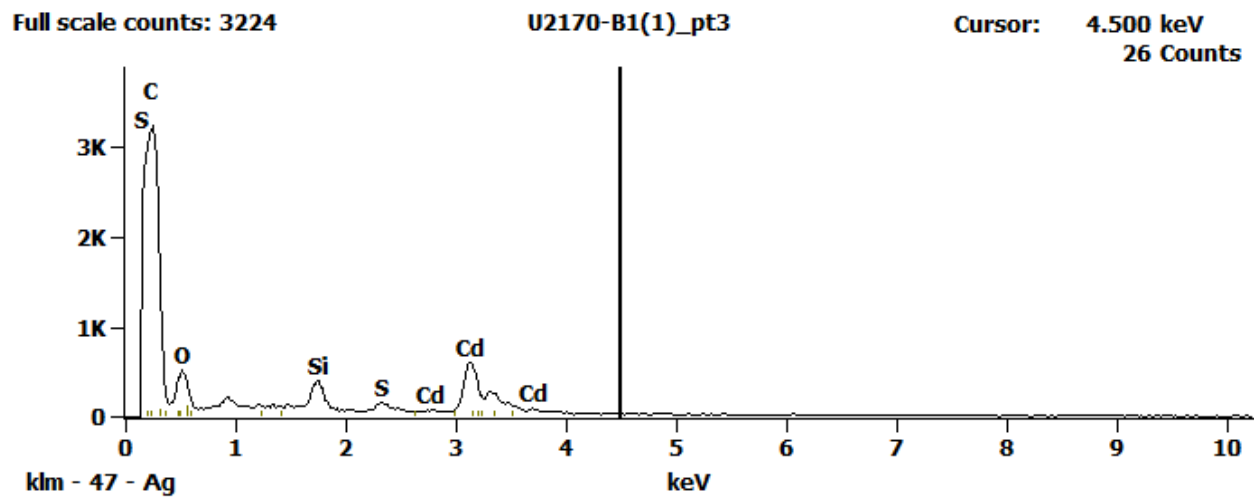
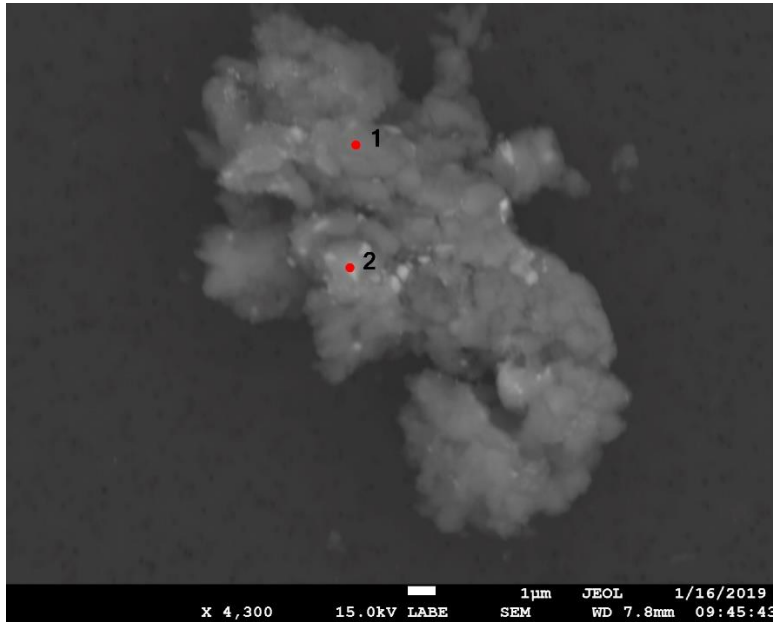


Figure 3. EDS spectra for sample U2170-B1 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 B2



Particle Size:	25 µm
Shape:	Irregular
Transparency:	Opaque
Color:	GRAY, CLEAR
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 9
Comments:	

SEM photo of sample U2170-B2 with labeled EDS testing locations..

Cluster of Origin: U2170 Cluster 9

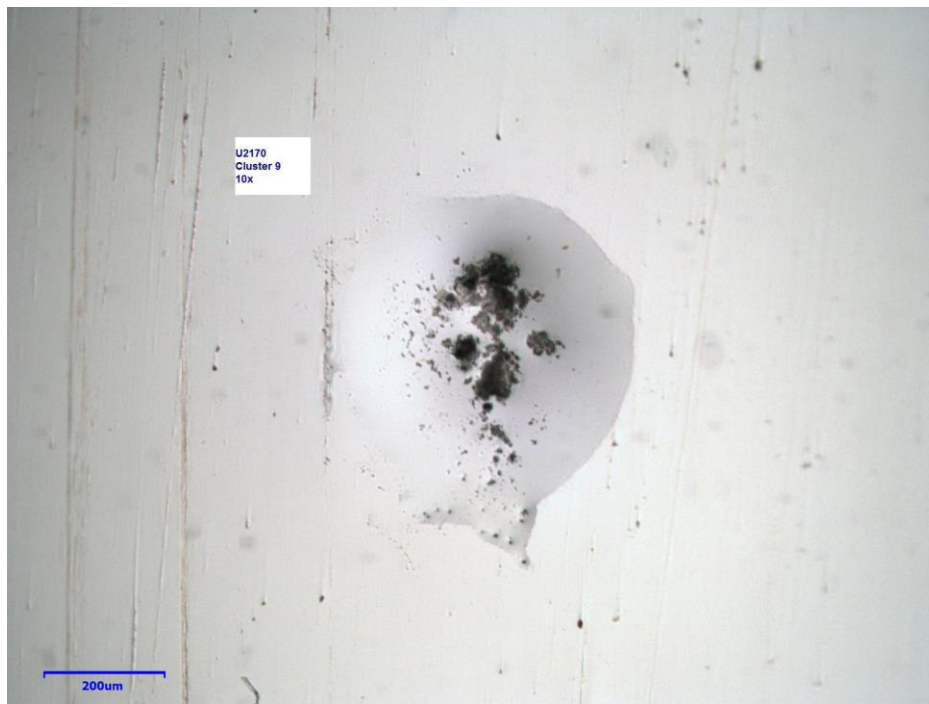


Photo of cluster U2170 Cluster 9.

U2170 B2 - EDS Spectra

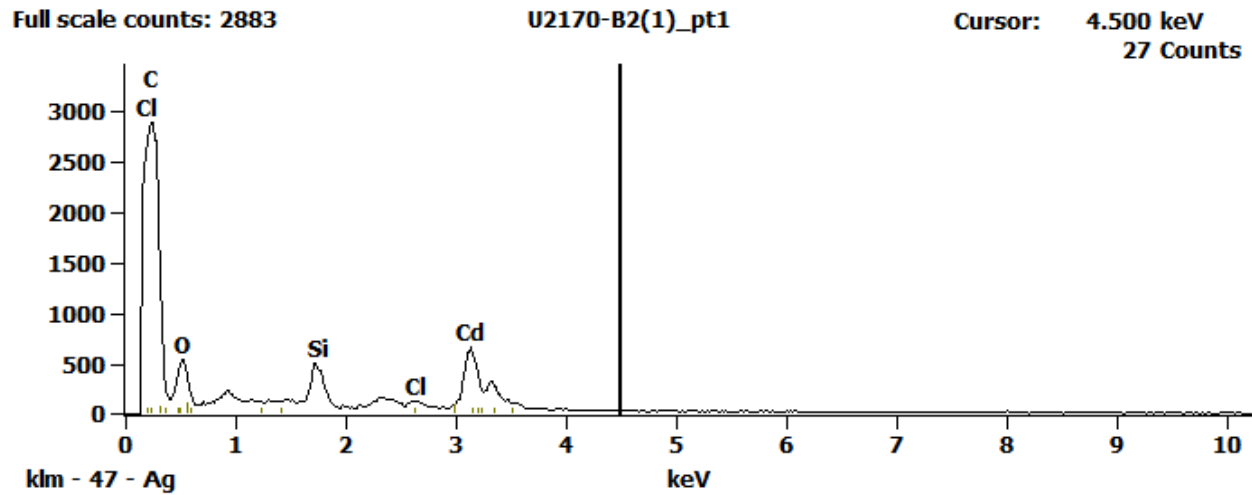


Figure 1. EDS spectra for sample U2170-B2 taken at test area 1. The test area is labeled in the particle SEM photo.

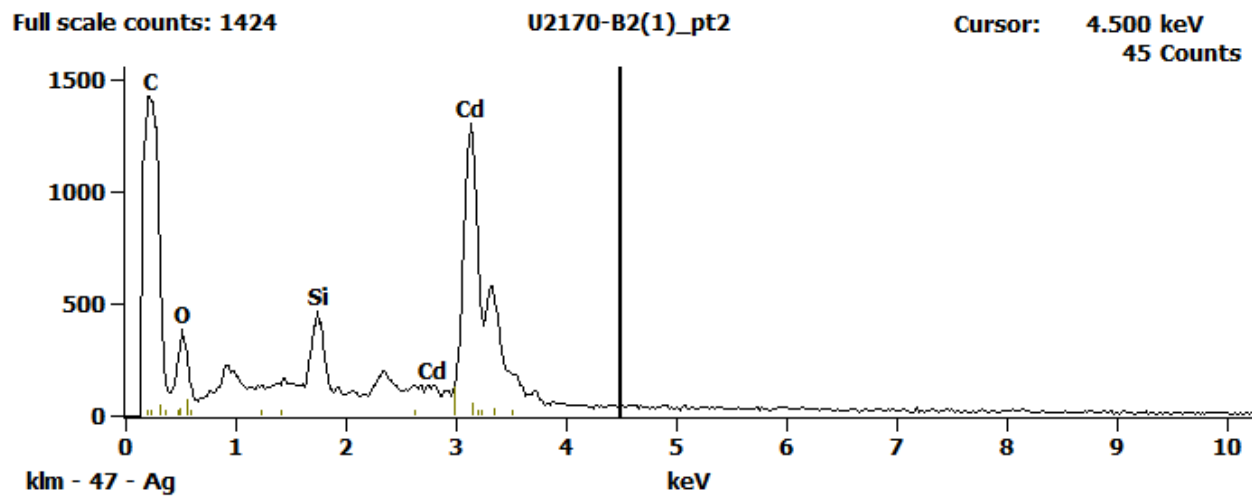
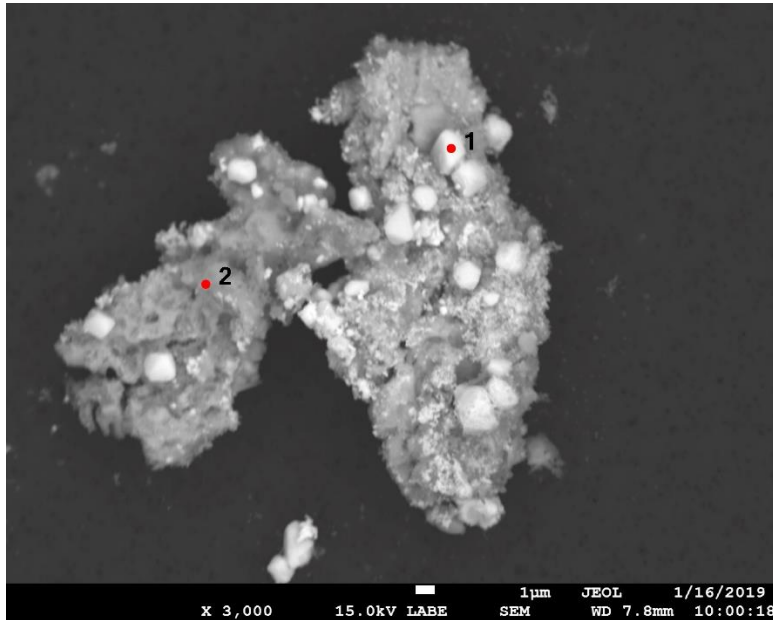


Figure 2. EDS spectra for sample U2170-B2 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B3



Particle Size:	20 µm
Shape:	Equidimensional
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 10
Comments:	

SEM photo of sample U2170-B3 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 10

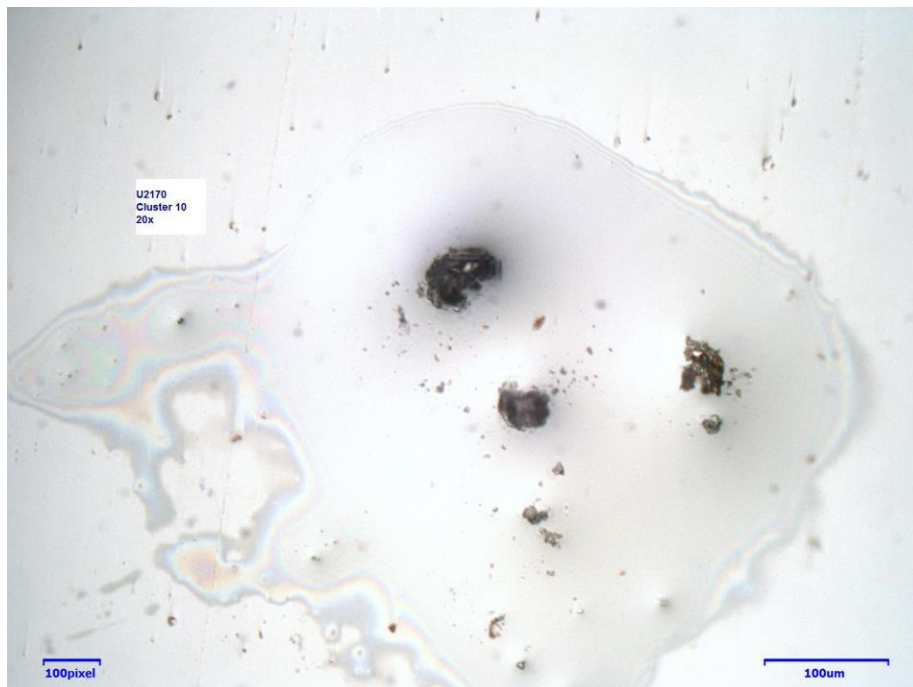


Photo of cluster U2170 Cluster 10.

U2170 B3 - EDS Spectra

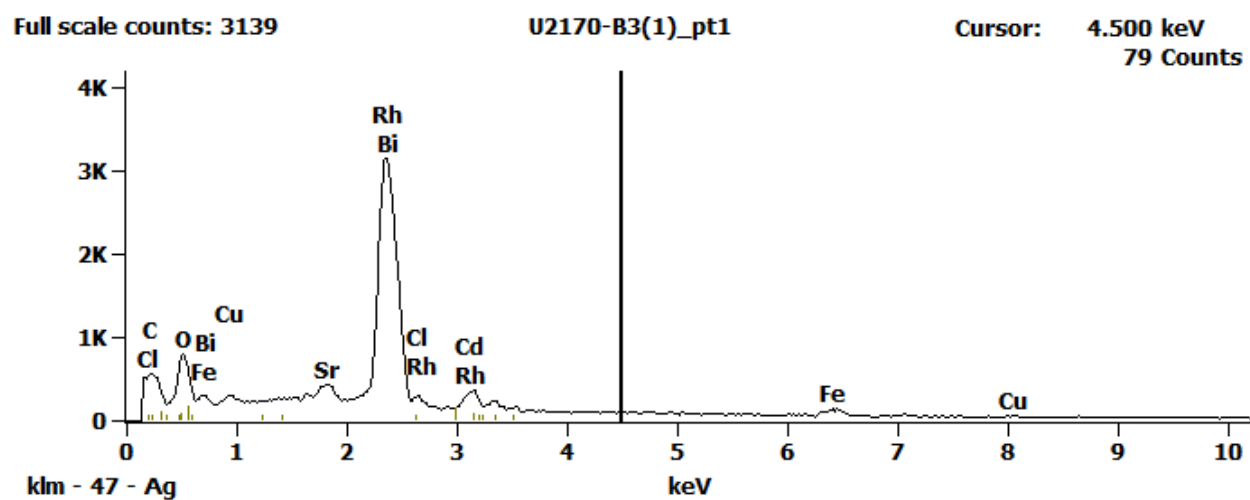


Figure 1. EDS spectra for sample U2170-B3 taken at test area 1. The test area is labeled in the particle SEM photo.

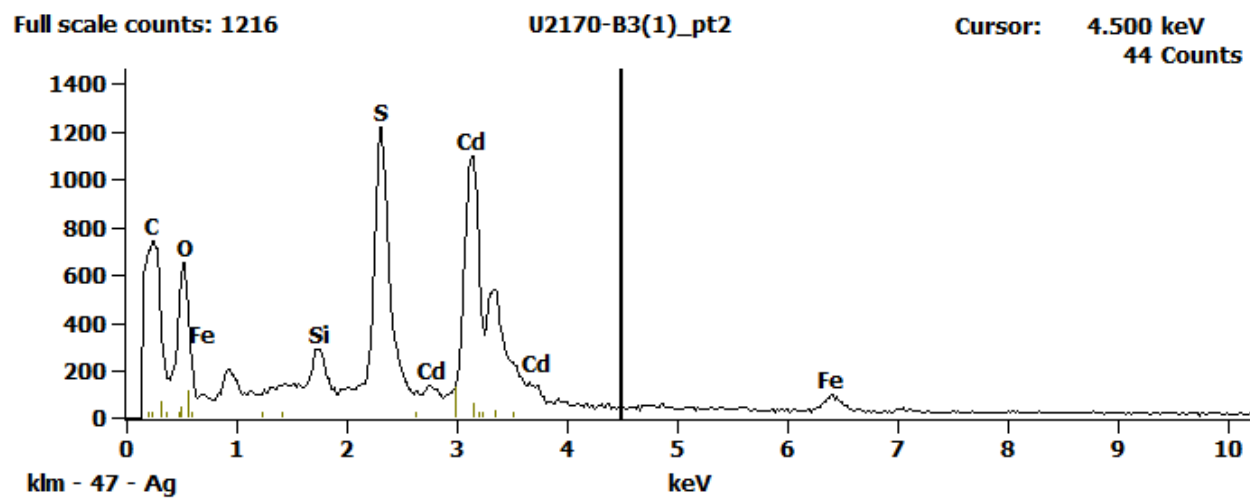
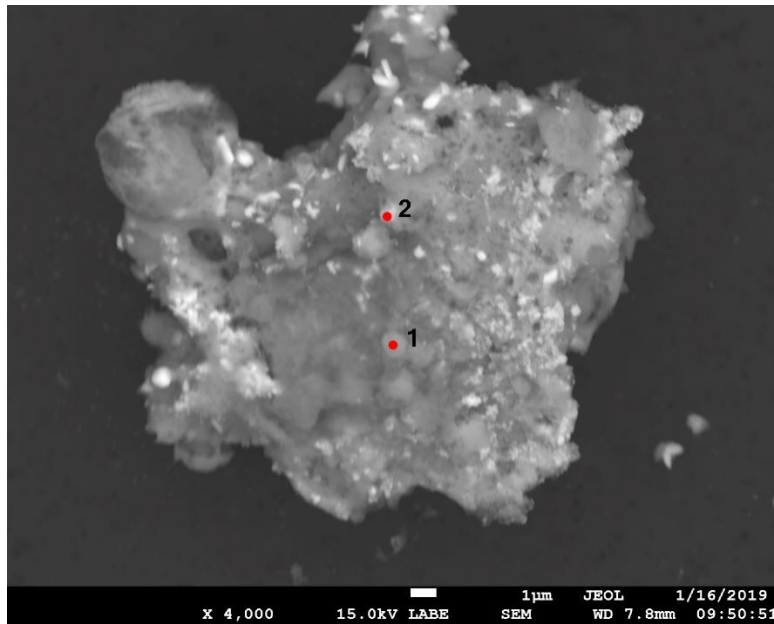


Figure 2. EDS spectra for sample U2170-B3 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B4



Particle Size:	20 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 10
Comments:	

SEM photo of sample U2170-B4 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 10

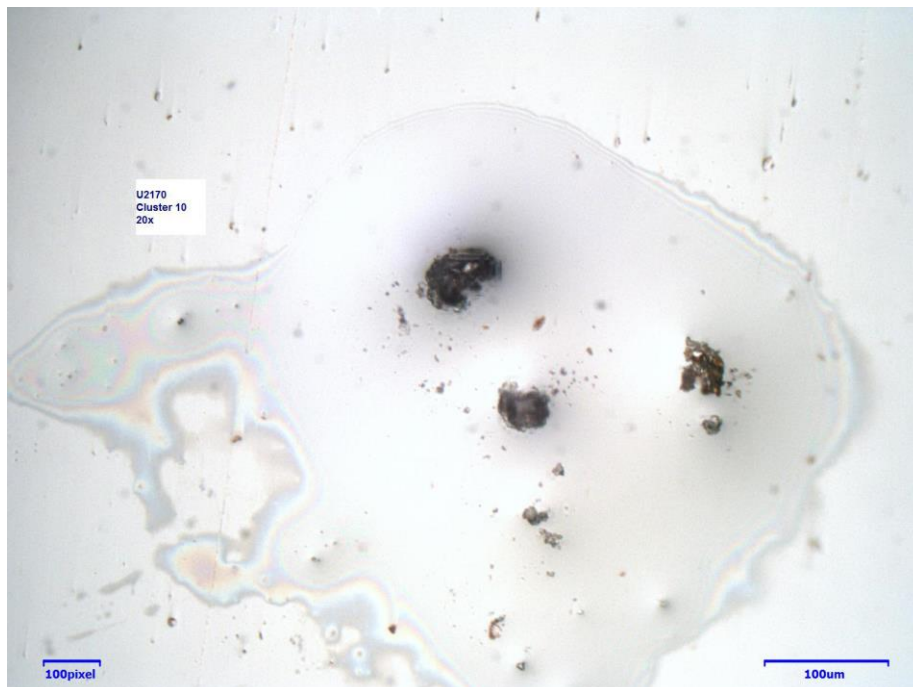


Photo of cluster U2170 Cluster 10.

U2170 B4 - EDS Spectra

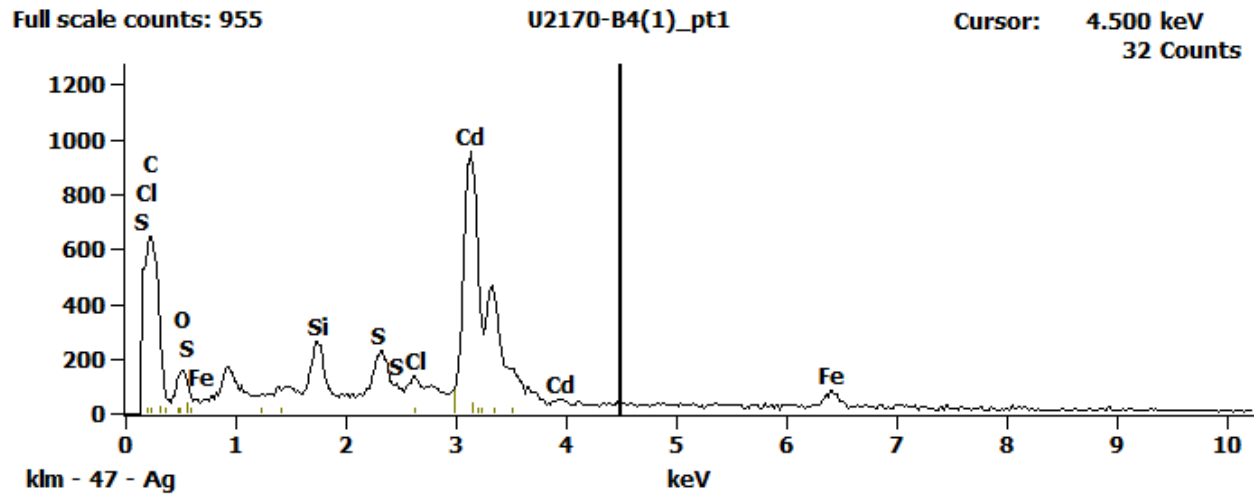


Figure 1. EDS spectra for sample U2170-B4 taken at test area 1. The test area is labeled in the particle SEM photo.

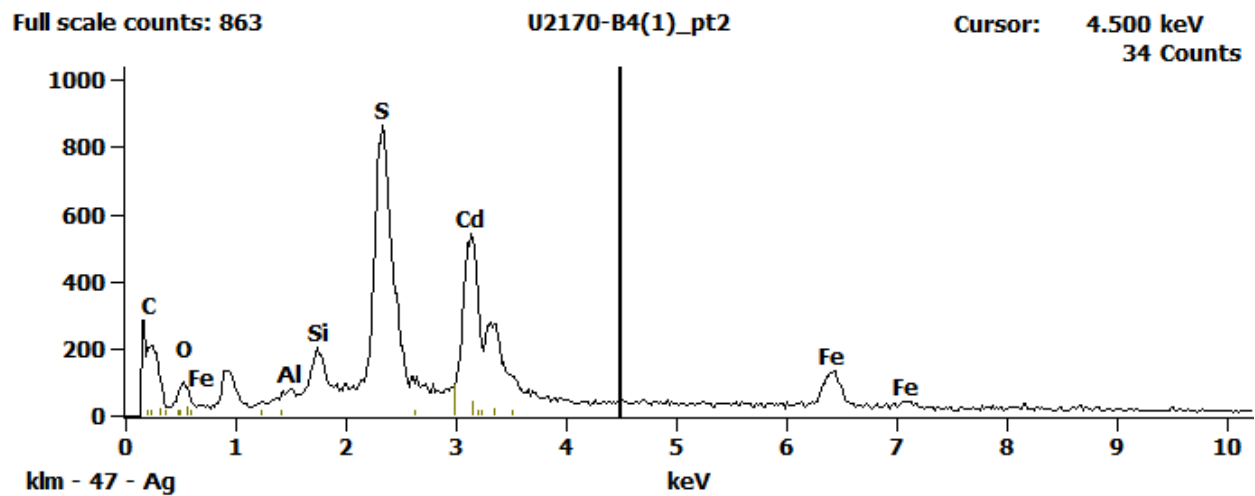
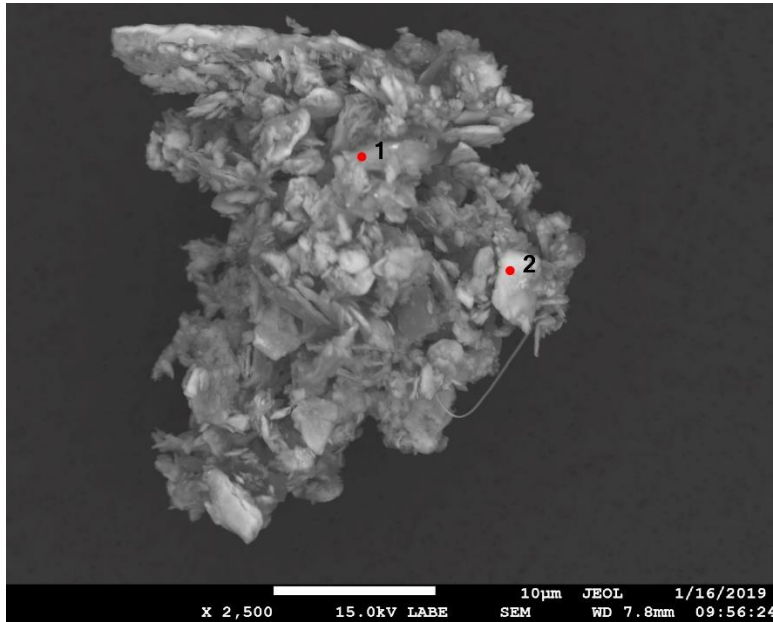


Figure 2. EDS spectra for sample U2170-B4 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B5



Particle Size:	22 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 11
Comments:	

SEM photo of sample U2170-B5 with labeled EDS testing locations..

Cluster of Origin: U2170 Cluster 11



Photo of cluster U2170 Cluster 11.

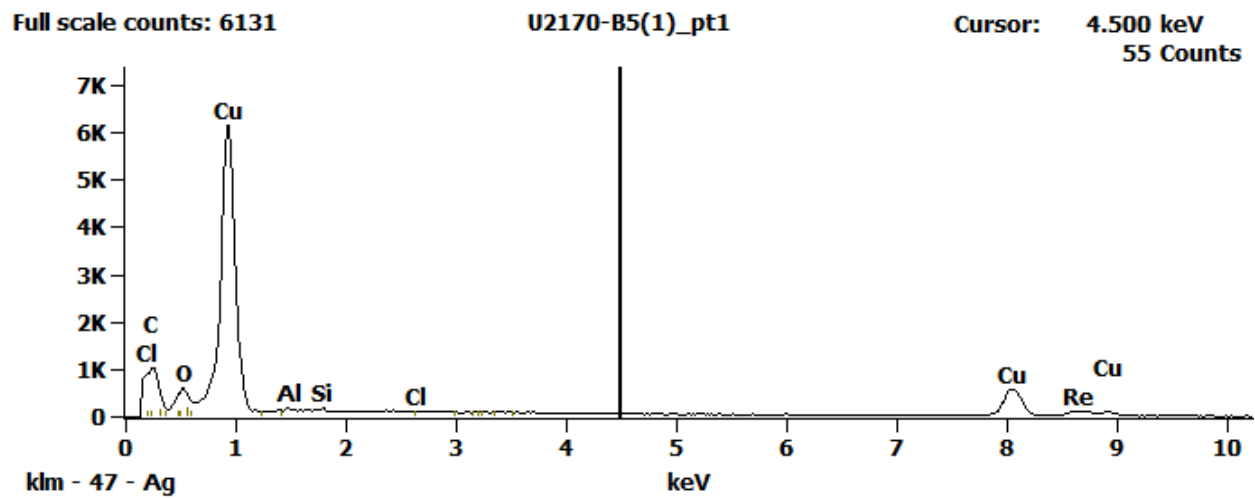
U2170 B5 - EDS Spectra

Figure 1. EDS spectra for sample U2170-B5 taken at test area 1. The test area is labeled in the particle SEM photo.

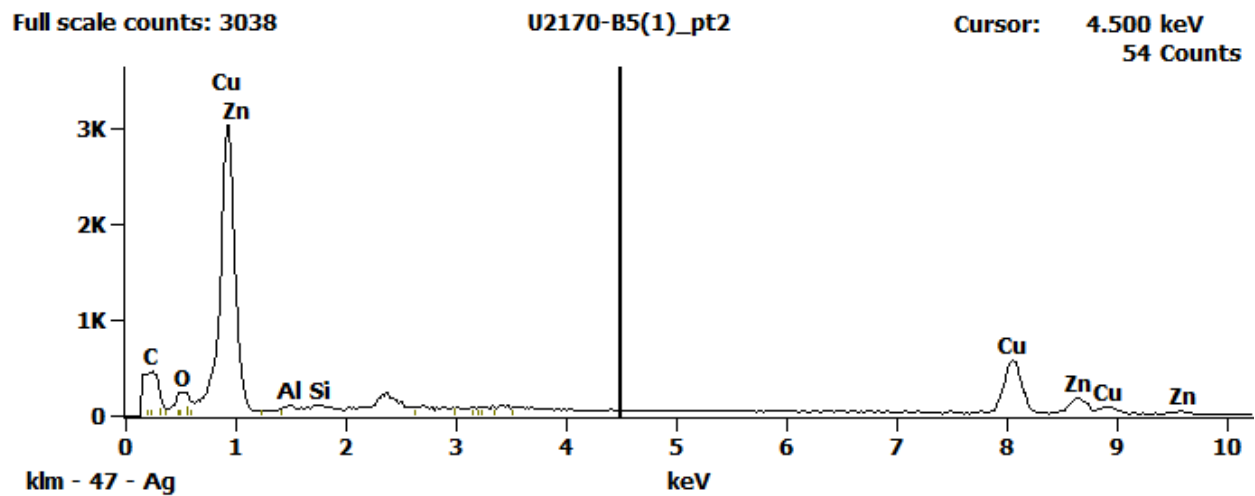
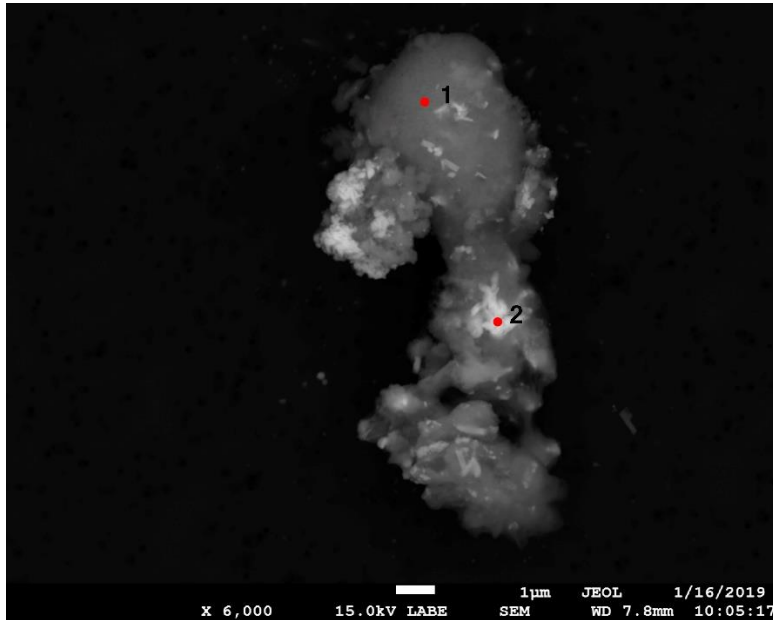


Figure 2. EDS spectra for sample U2170-B5 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B6



Particle Size: 14 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 11
Comments:

SEM photo of sample U2170-B6 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 11



Photo of cluster U2170 Cluster 11.

U2170 B6 - EDS Spectra

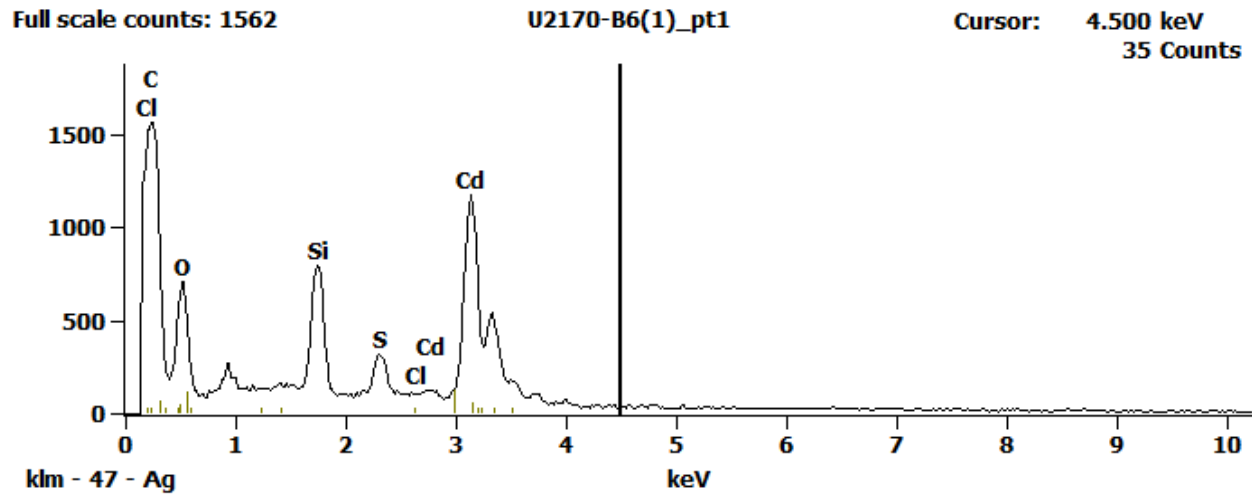


Figure 1. EDS spectra for sample U2170-B6 taken at test area 1. The test area is labeled in the particle SEM photo.

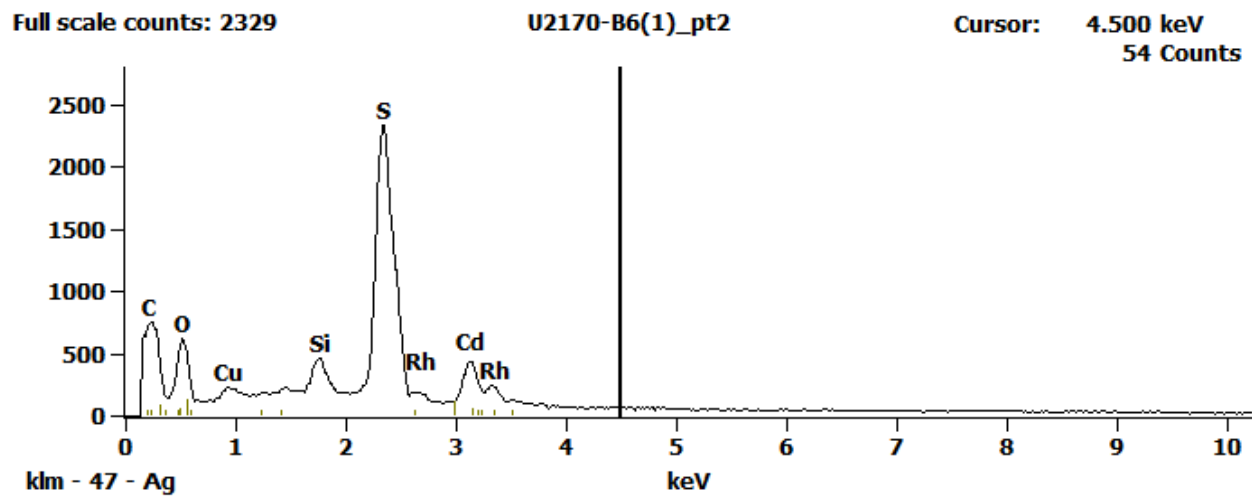
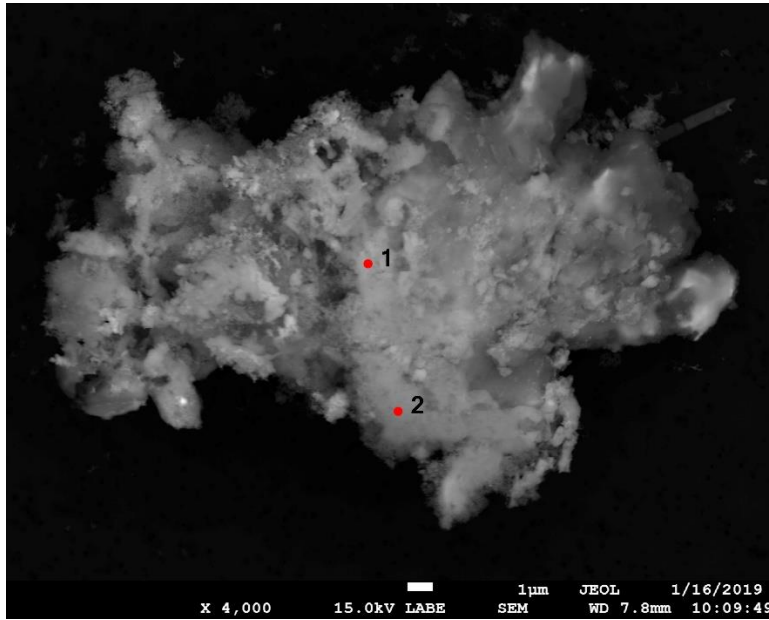


Figure 2. EDS spectra for sample U2170-B6 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B7



Particle Size: 27x17 µm
Shape: Irregular
Transparency: Translucent to Opaque
Color: CLEAR, GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 12
Comments:

SEM photo of sample U2170-B7 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 12

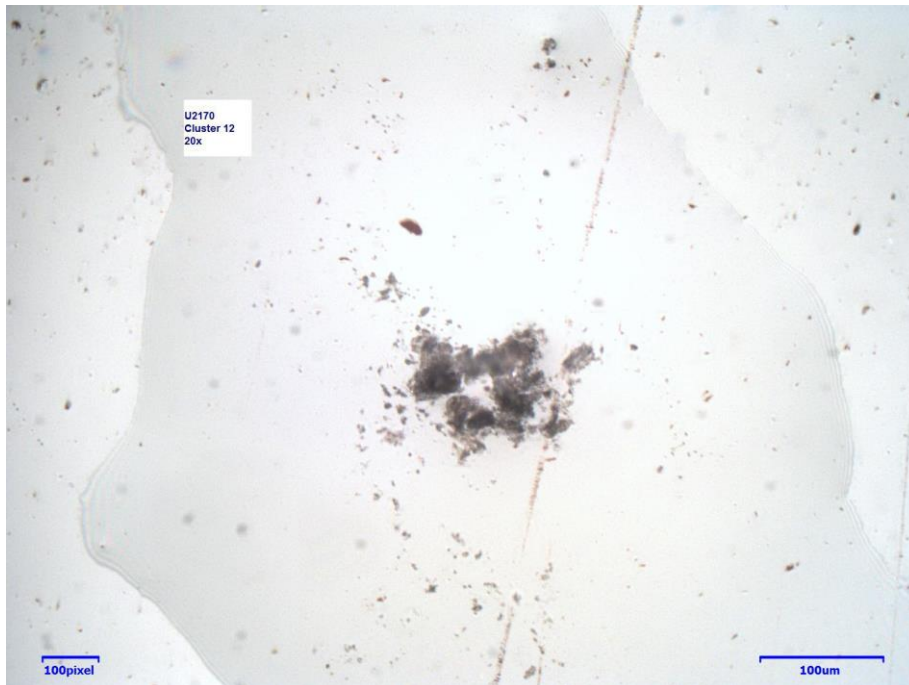


Photo of cluster U2170 Cluster 12.

U2170 B7 - EDS Spectra

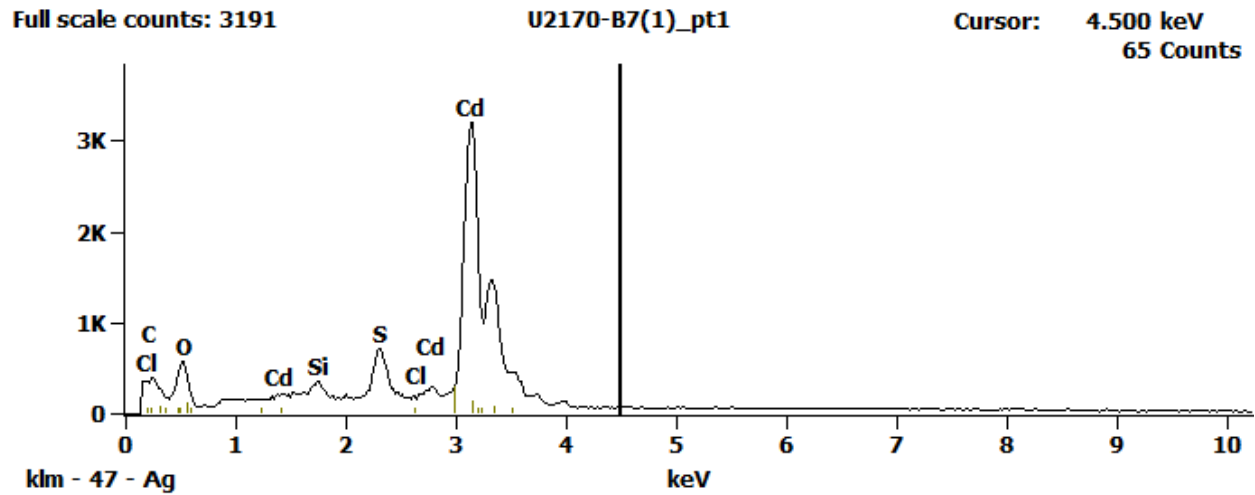


Figure 1. EDS spectra for sample U2170-B7 taken at test area 1. The test area is labeled in the particle SEM photo.

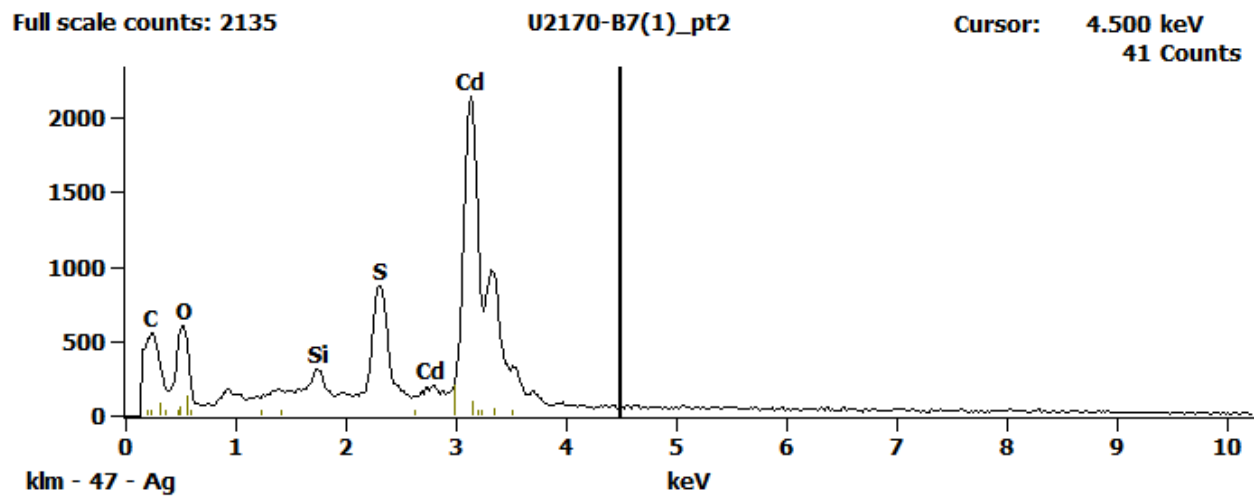
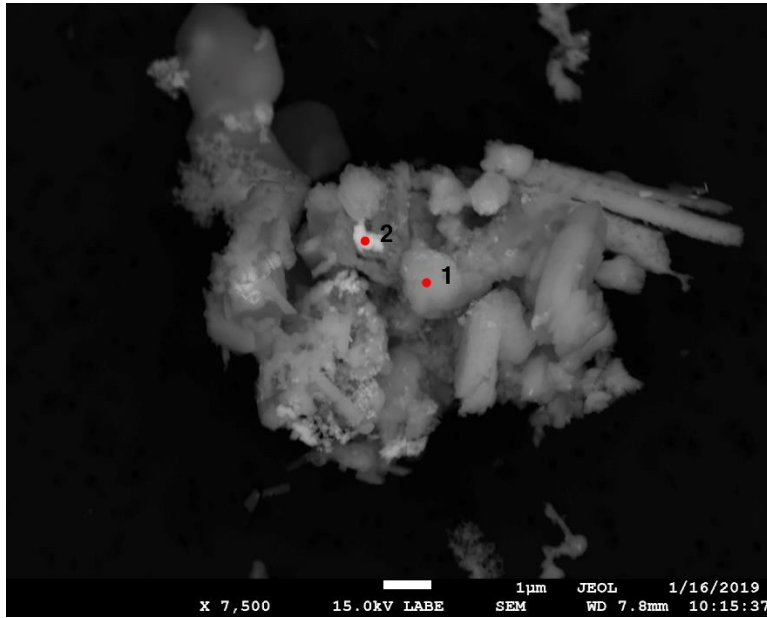


Figure 2. EDS spectra for sample U2170-B7 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B8



Particle Size: 17 µm
Shape: Irregular
Transparency: Translucent to Opaque
Color: CLEAR, GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 12
Comments:

SEM photo of sample U2170-B8 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 12

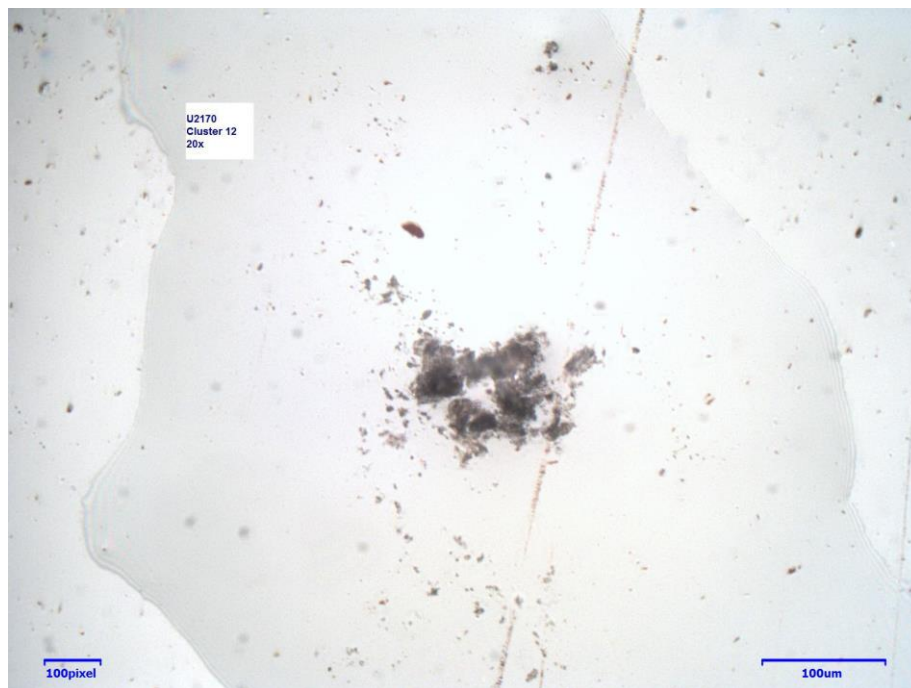


Photo of cluster U2170 Cluster 12.

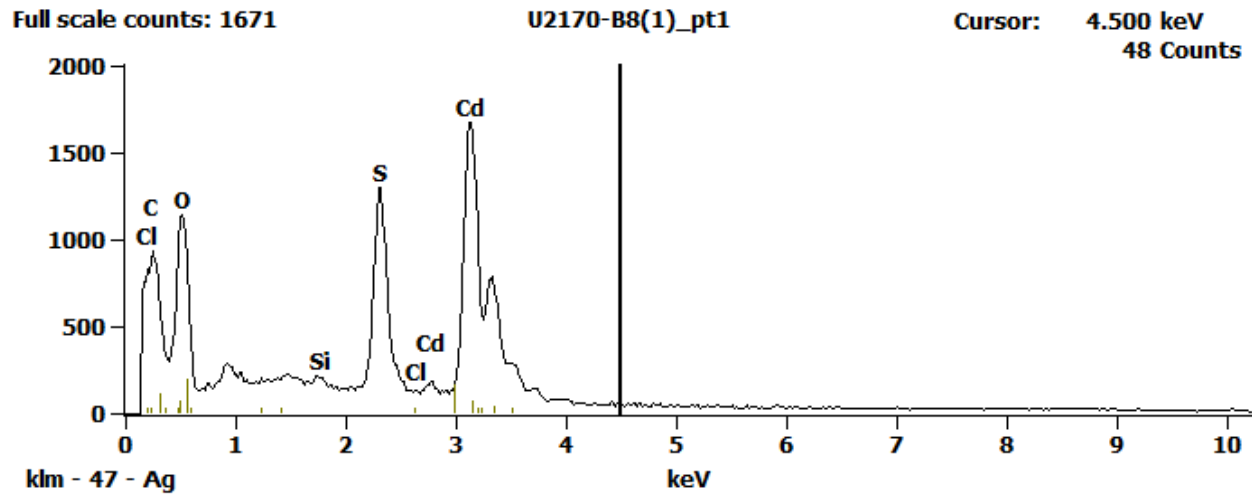
U2170 B8 - EDS Spectra

Figure 1. EDS spectra for sample U2170-B8 taken at test area 1. The test area is labeled in the particle SEM photo.

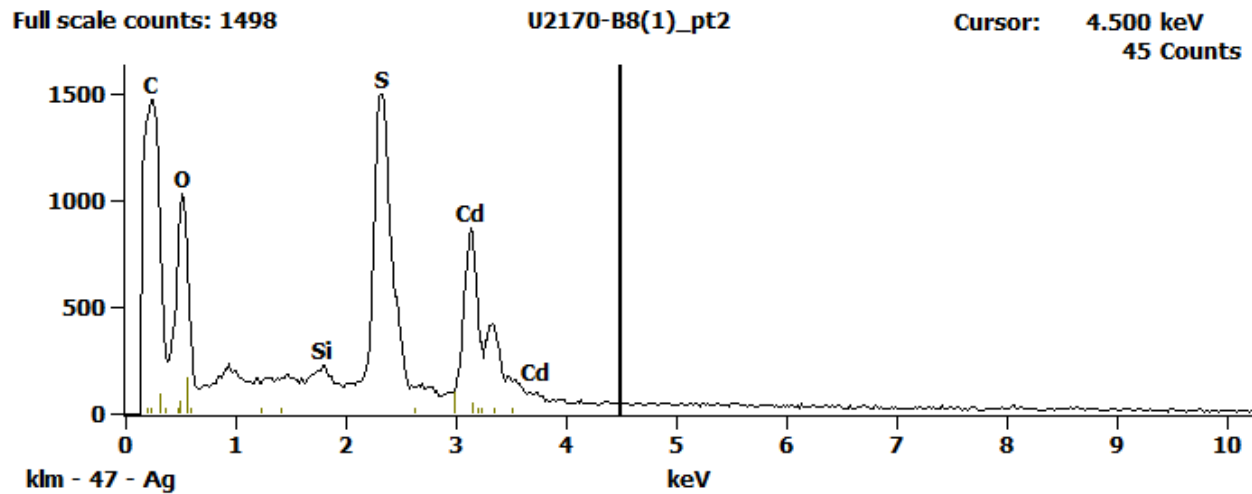
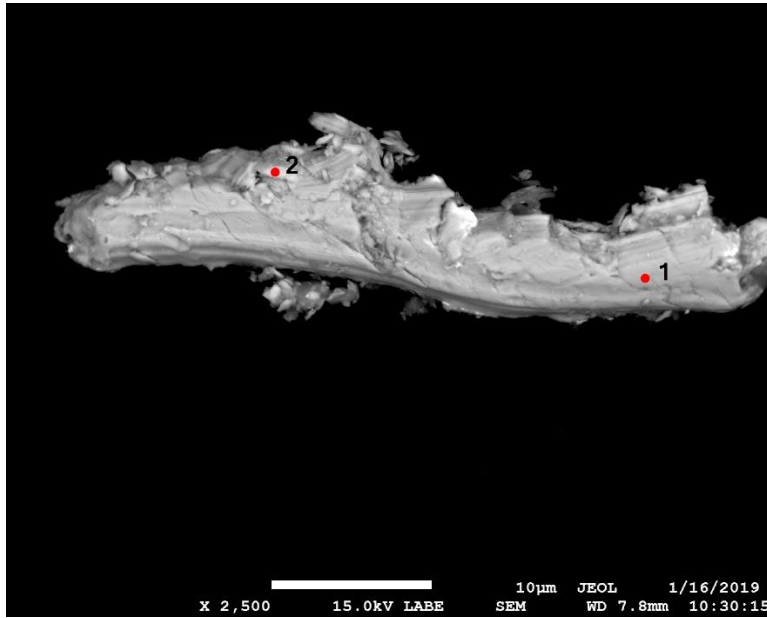


Figure 2. EDS spectra for sample U2170-B8 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B10



SEM photo of sample U2170-B10 with labeled EDS testing locations.

Particle Size:	40x20 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 13
Comments:	

Cluster of Origin: U2170 Cluster 13

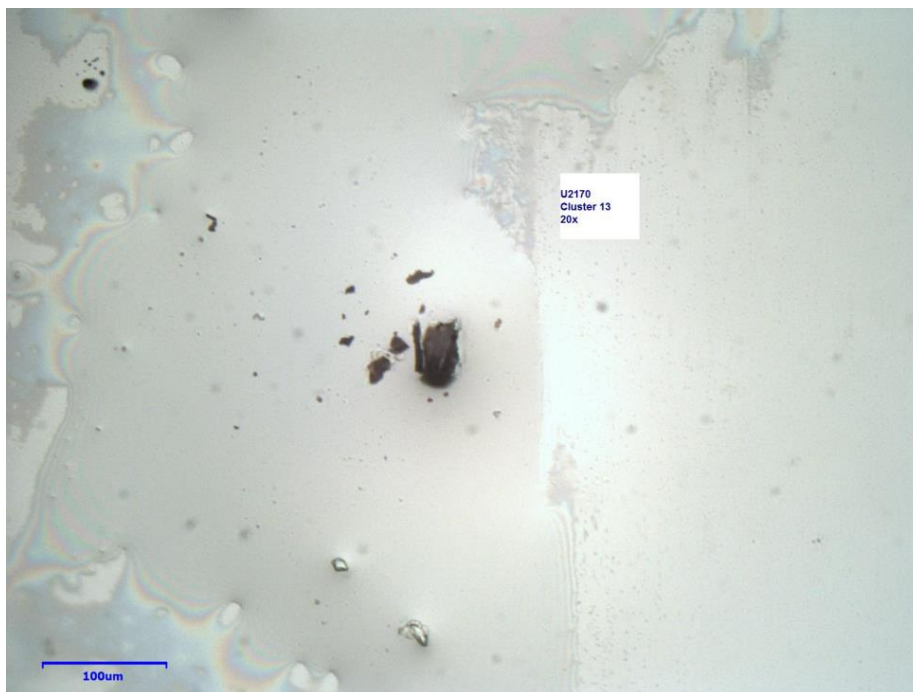


Photo of cluster U2170 Cluster 13.

U2170 B10 - EDS Spectra

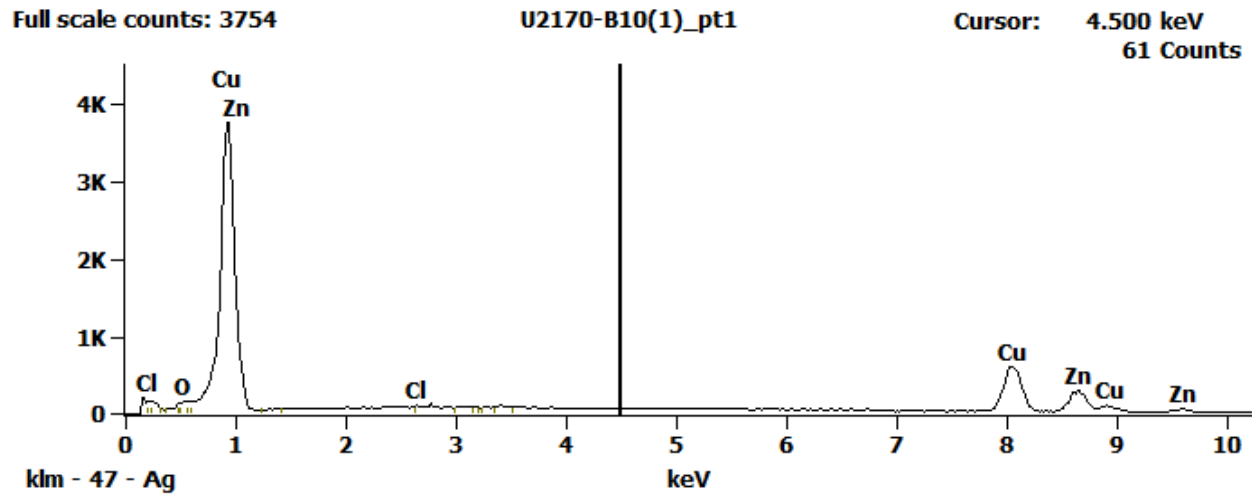


Figure 1. EDS spectra for sample U2170-B10 taken at test area 1. The test area is labeled in the particle SEM photo.

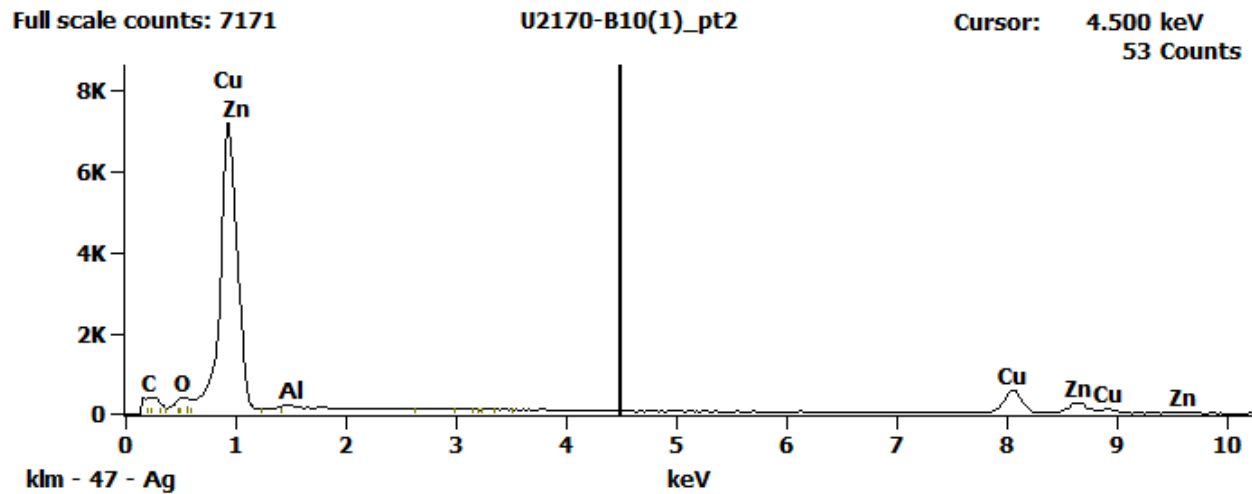
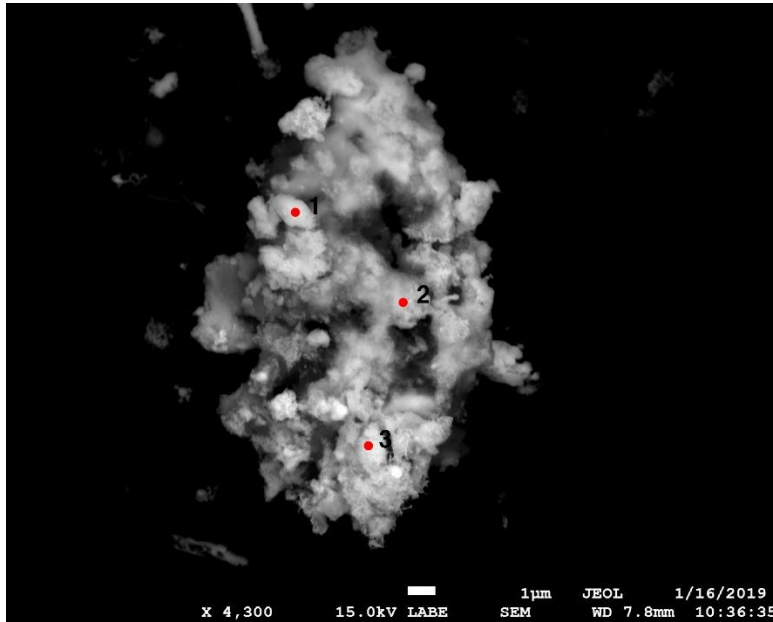


Figure 2. EDS spectra for sample U2170-B10 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B11



SEM photo of sample U2170-B11 with labeled EDS testing locations.

Particle Size:	20 µm
Shape:	Equidimensional to Irregular
Transparency:	Translucent to Opaque
Color:	CLEAR,GRAY
Luster:	Pearly to Subvitreous
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 14
Comments:	

Cluster of Origin: U2170 Cluster 14

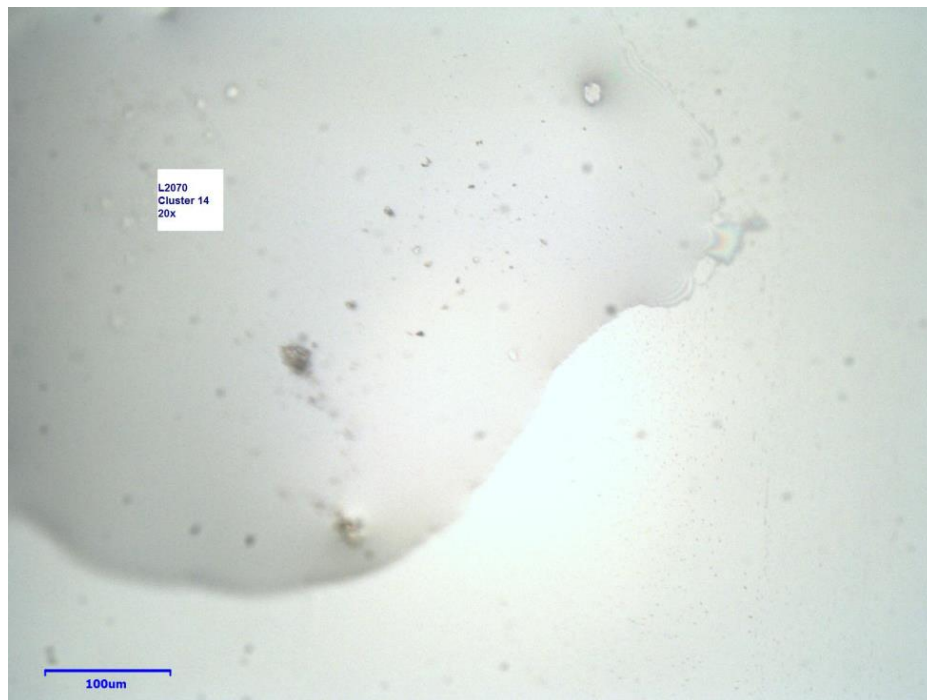


Photo of cluster U2170 Cluster 14.

U2170 B11 - EDS Spectra

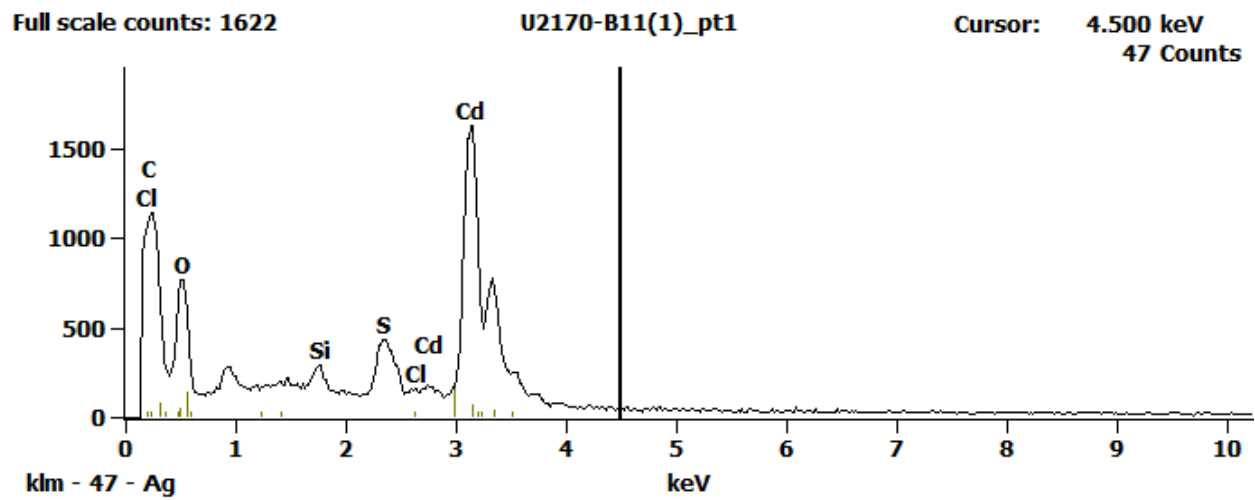


Figure 1. EDS spectra for sample U2170-B11 taken at test area 1. The test area is labeled in the particle SEM photo.

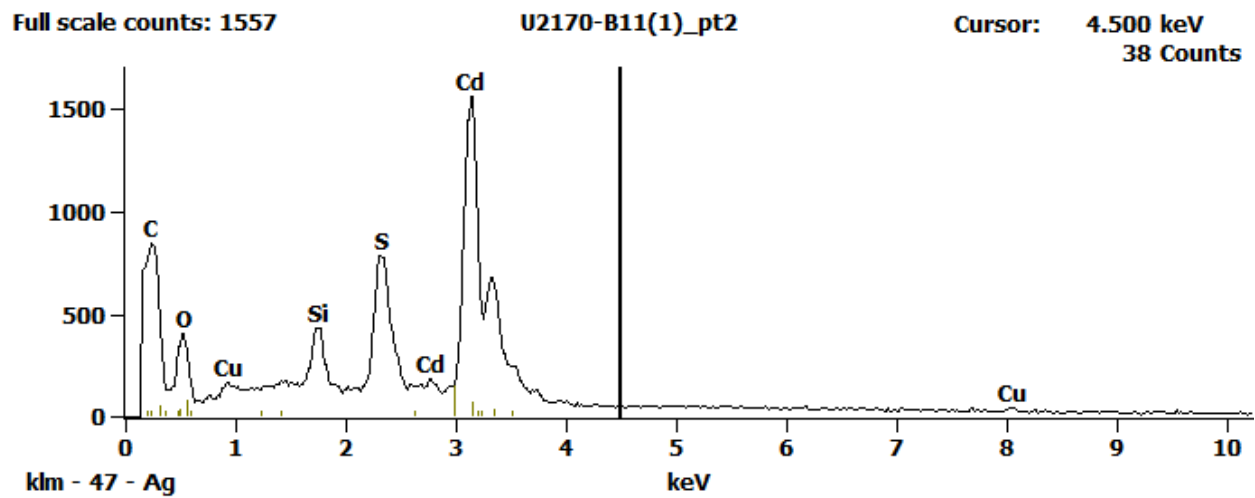


Figure 2. EDS spectra for sample U2170-B11 taken at test area 2. The test area is labeled in the particle SEM photo.

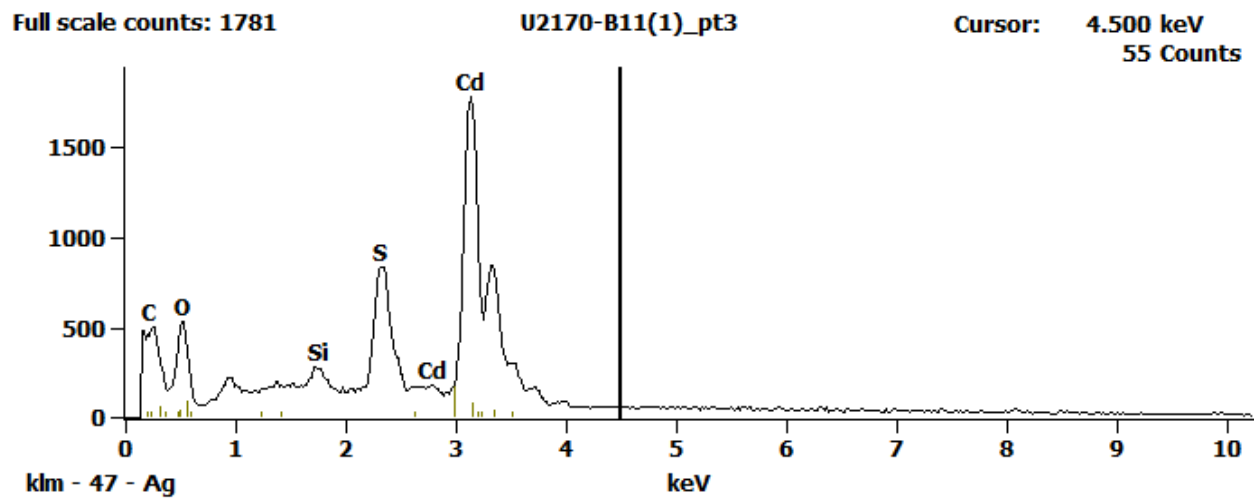
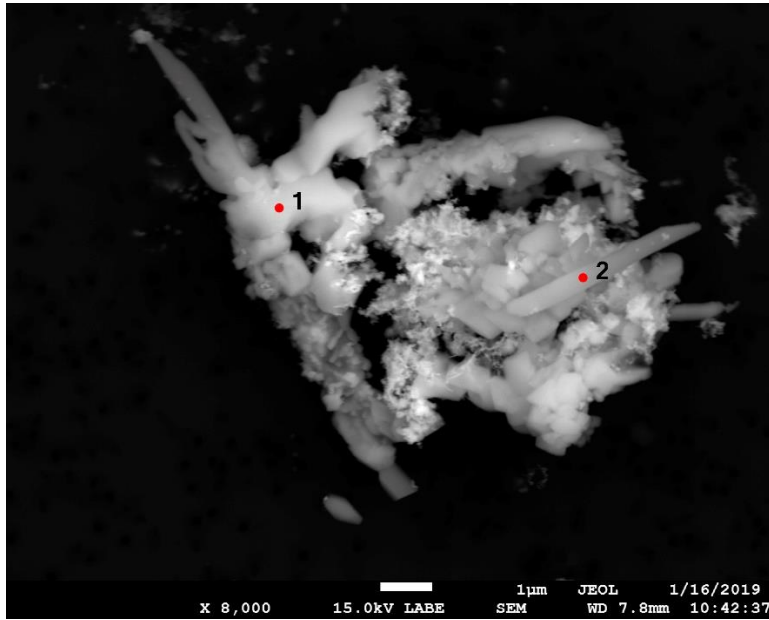


Figure 3. EDS spectra for sample U2170-B11 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 B12



SEM photo of sample U2170-B12 with labeled EDS testing locations.

Particle Size:	9 µm
Shape:	Equidimensional to Irregular
Transparency:	Translucent to Opaque
Color:	CLEAR, GRAY
Luster:	Pearly to Subvitreous
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 14
Comments:	

Cluster of Origin: U2170 Cluster 14

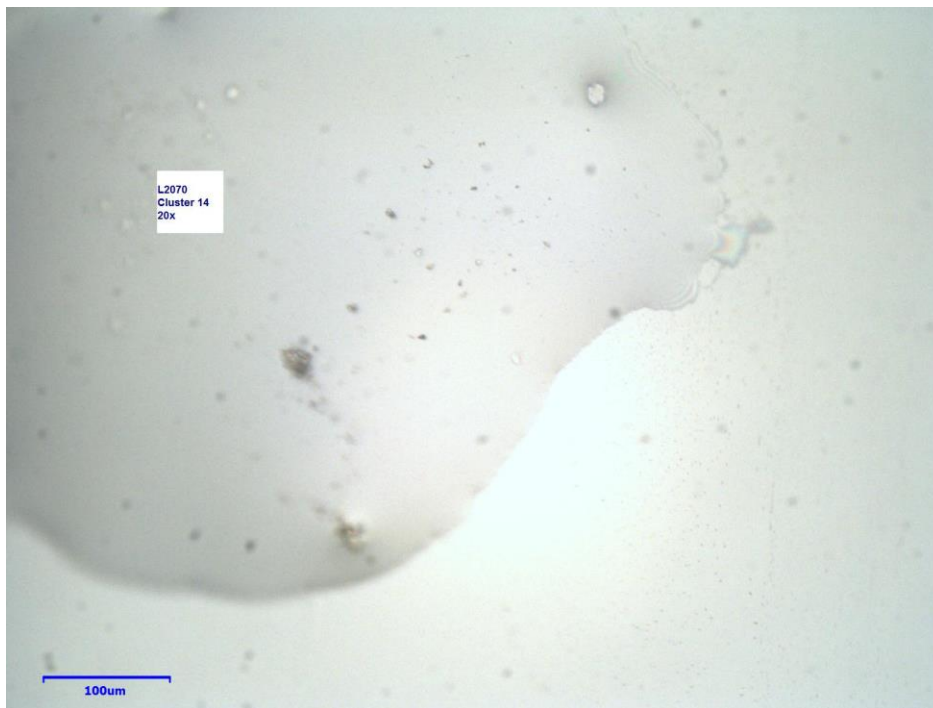


Photo of cluster U2170 Cluster 14.

U2170 B12 - EDS Spectra

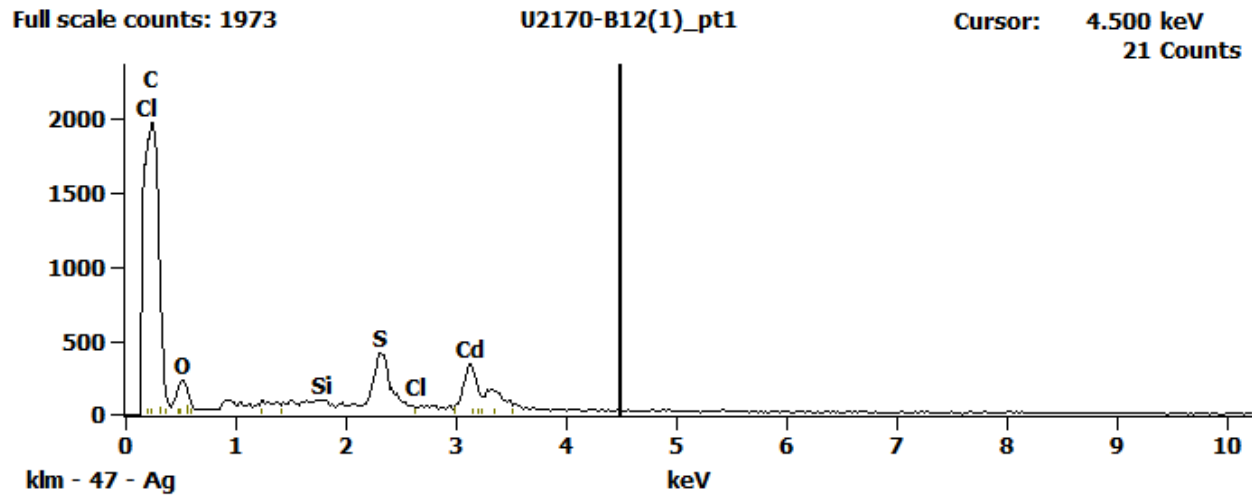


Figure 1. EDS spectra for sample U2170-B12 taken at test area 1. The test area is labeled in the particle SEM photo.

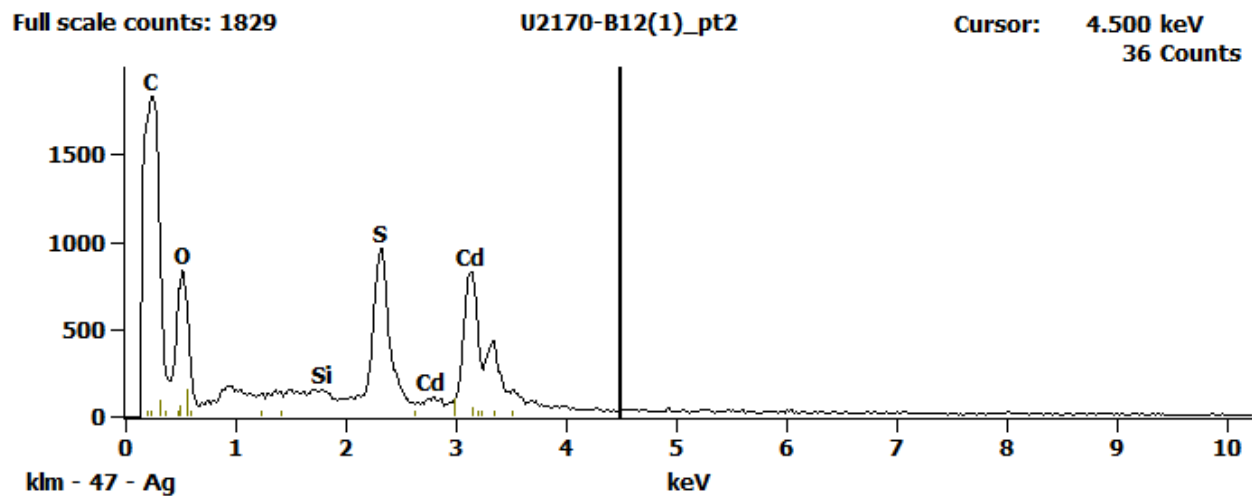
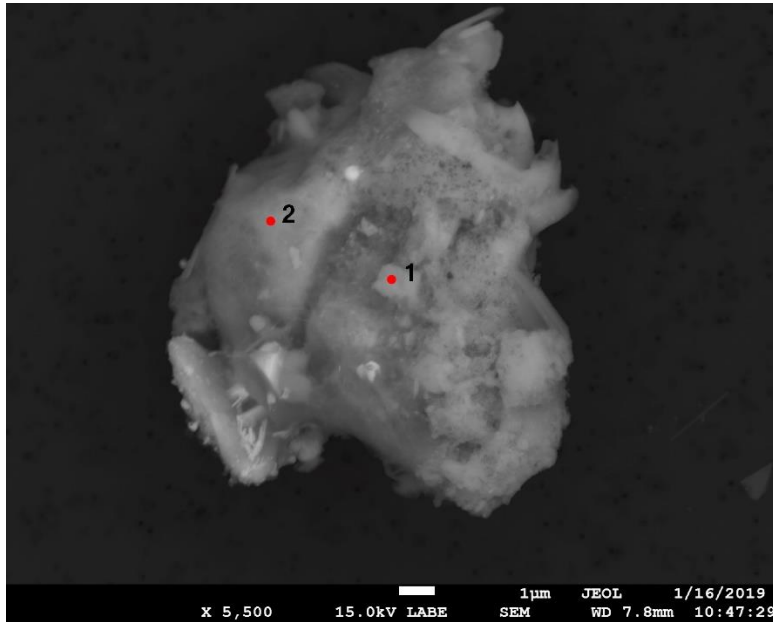


Figure 2. EDS spectra for sample U2170-B12 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B13



Particle Size:	14 µm
Shape:	Equidimensional
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 15
Comments:	

SEM photo of sample U2170-B13 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 15

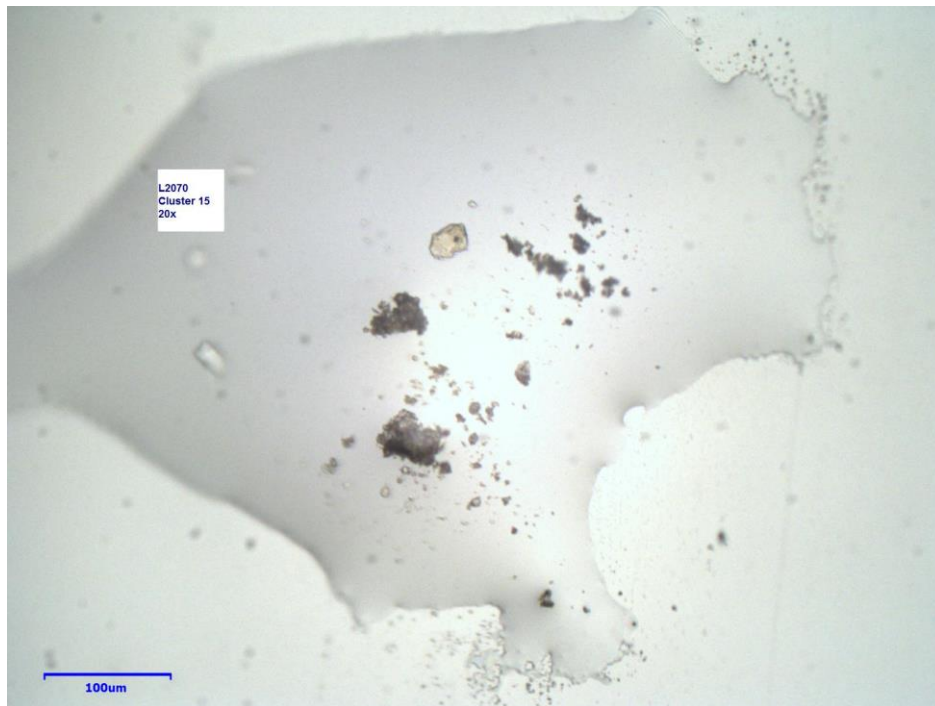


Photo of cluster U2170 Cluster 15.

U2170 B13 - EDS Spectra

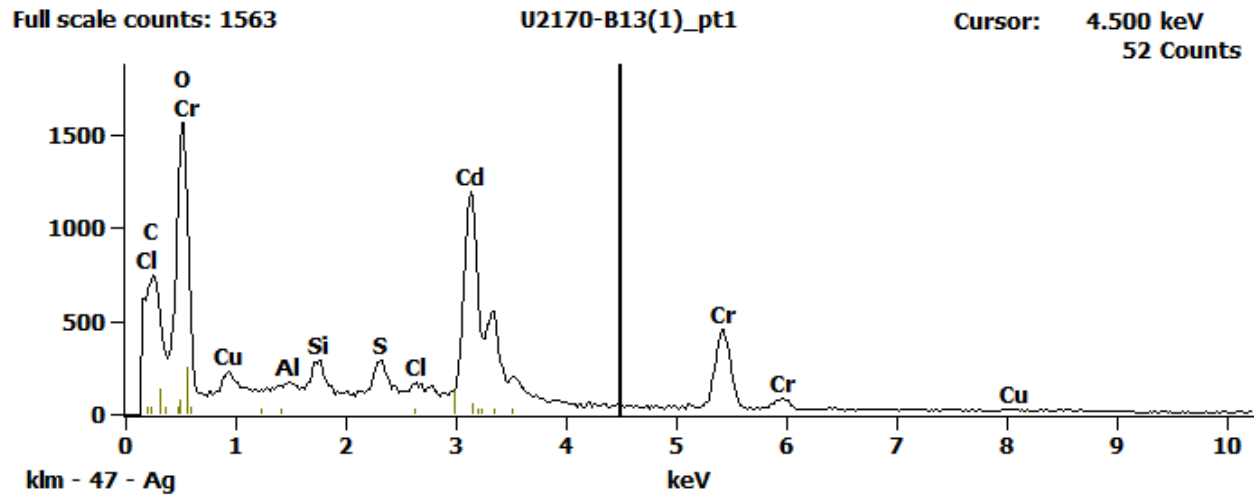


Figure 1. EDS spectra for sample U2170-B13 taken at test area 1. The test area is labeled in the particle SEM photo.

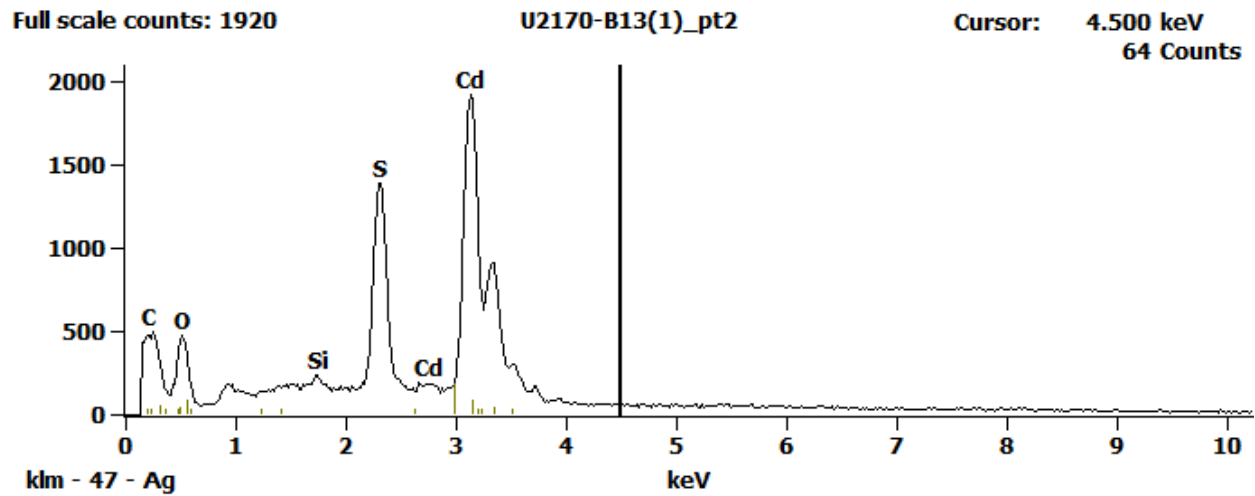
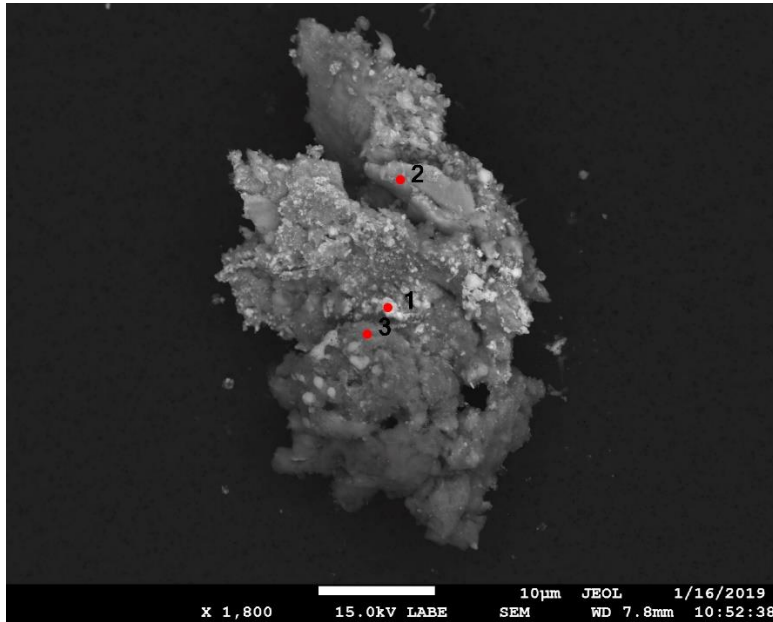


Figure 2. EDS spectra for sample U2170-B13 taken at test area 2. The test area is labeled in the particle SEM photo.

U2170 B14



Particle Size: 25x50 µm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK, GRAY
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 15
Comments:

SEM photo of sample U2170-B14 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 15

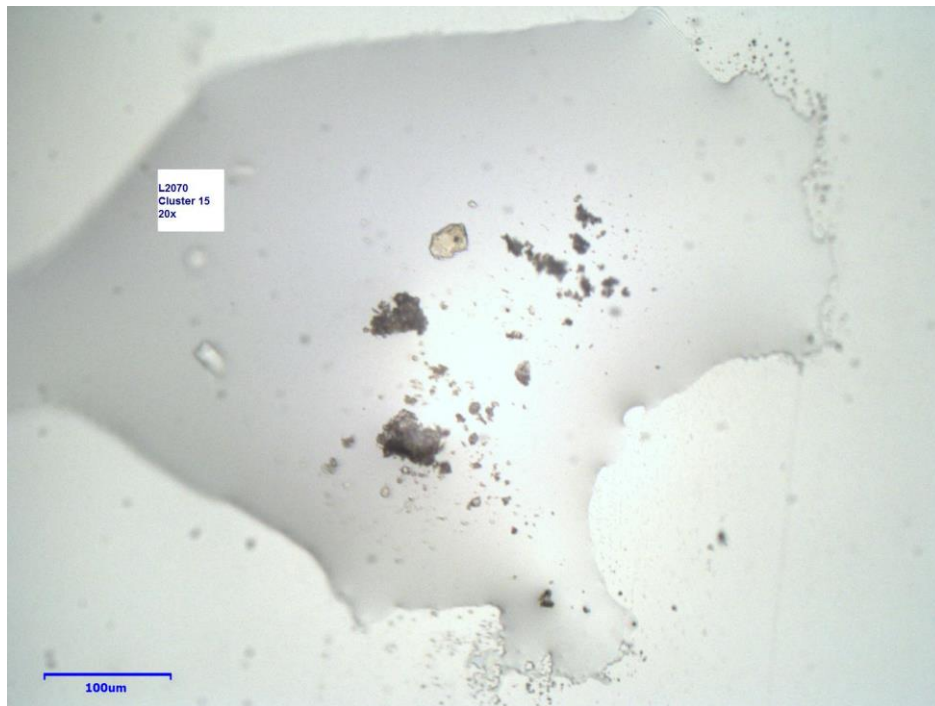


Photo of cluster U2170 Cluster 15.

U2170 B14 - EDS Spectra

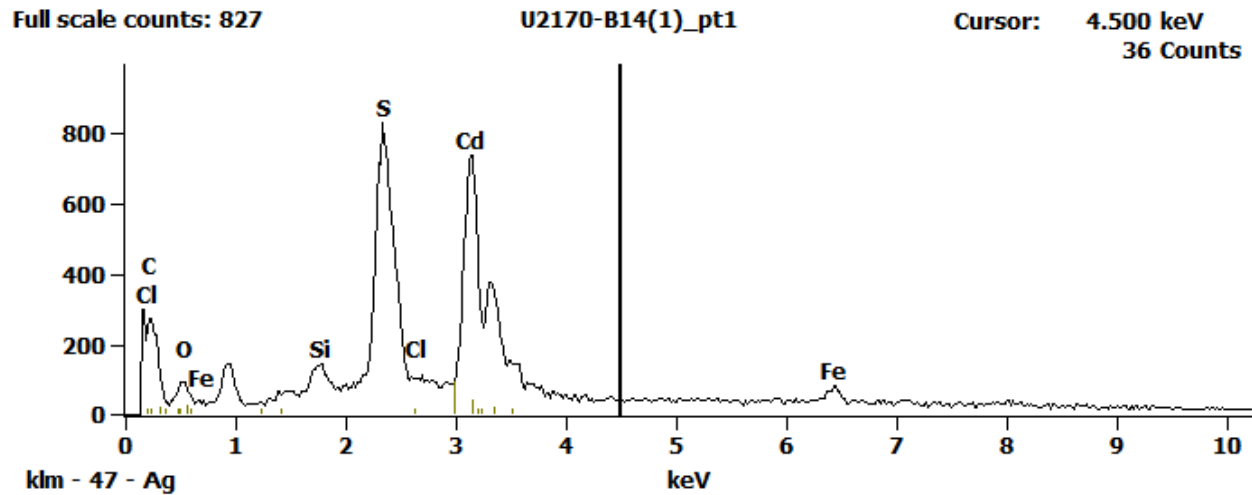


Figure 1. EDS spectra for sample U2170-B14 taken at test area 1. The test area is labeled in the particle SEM photo.

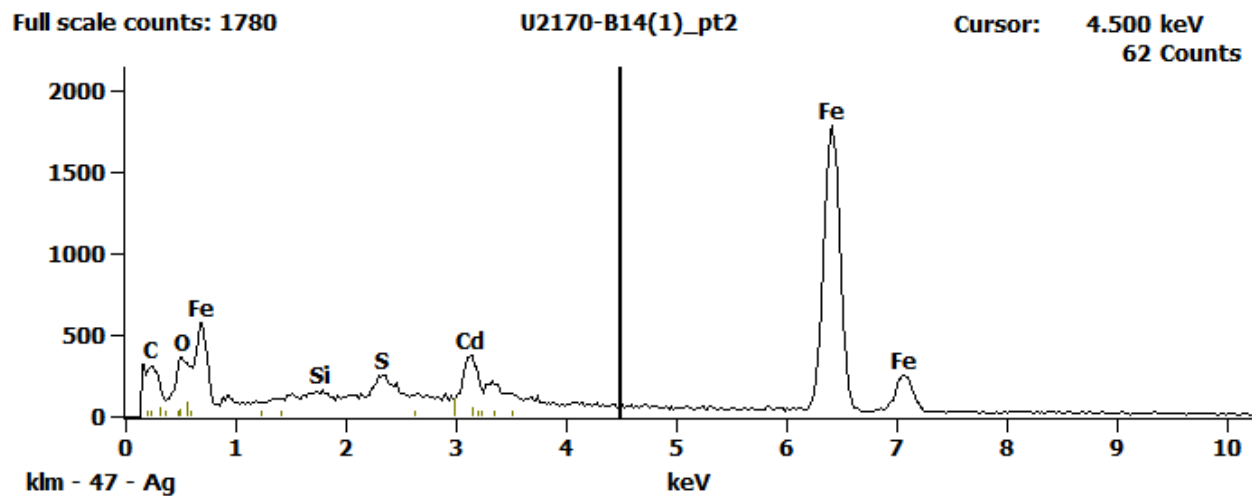


Figure 2. EDS spectra for sample U2170-B14 taken at test area 2. The test area is labeled in the particle SEM photo.

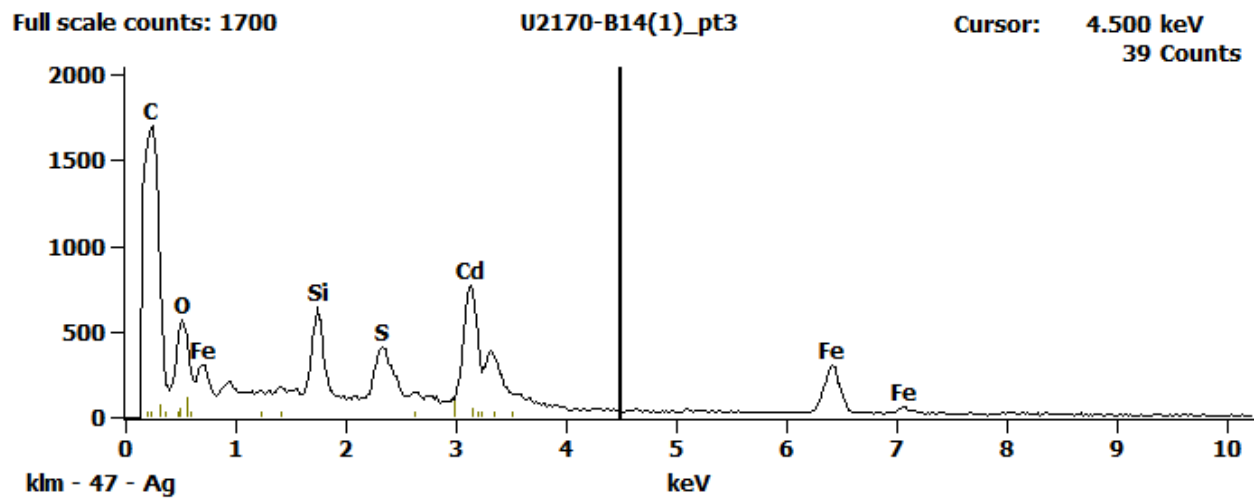
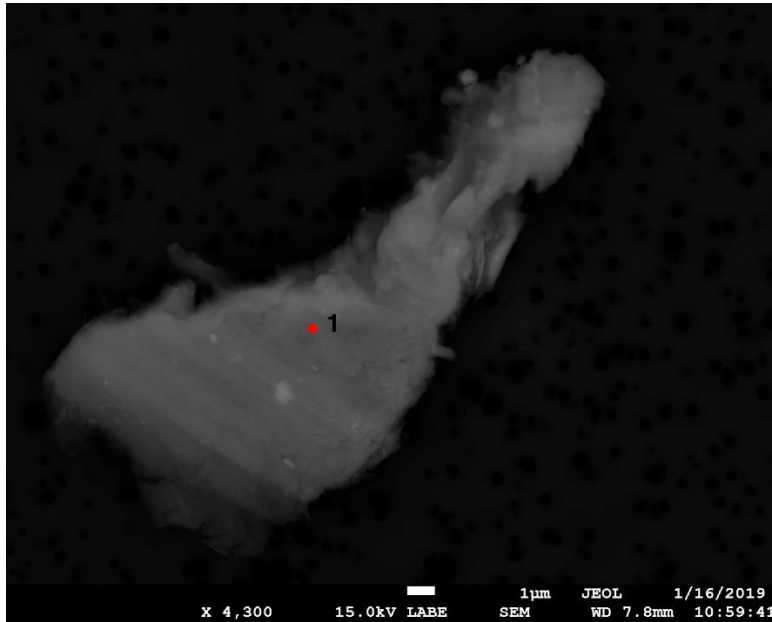


Figure 3. EDS spectra for sample U2170-B14 taken at test area 3. The test area is labeled in the particle SEM photo.

U2170 B15



Particle Size:	10 µm
Shape:	Equidimensional
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 16
Comments:	

SEM photo of sample U2170-B15 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 16

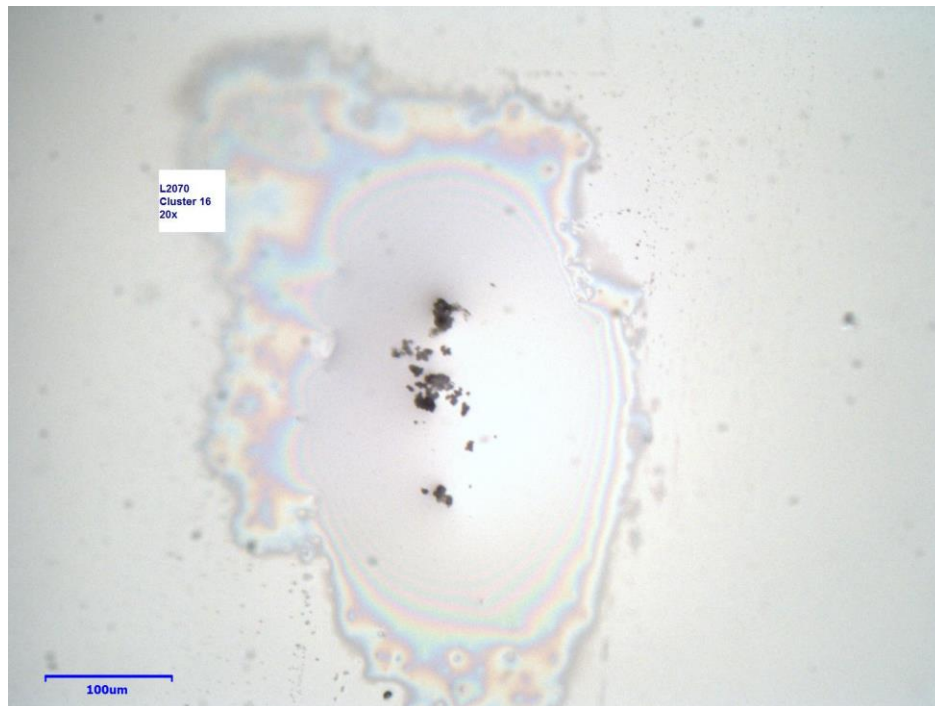


Photo of cluster U2170 Cluster 16.

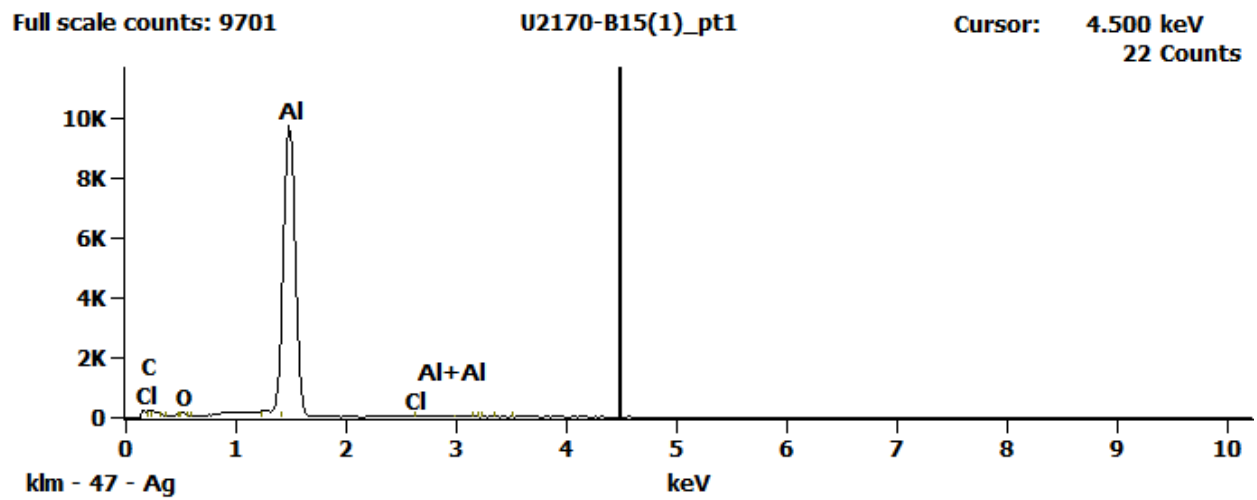
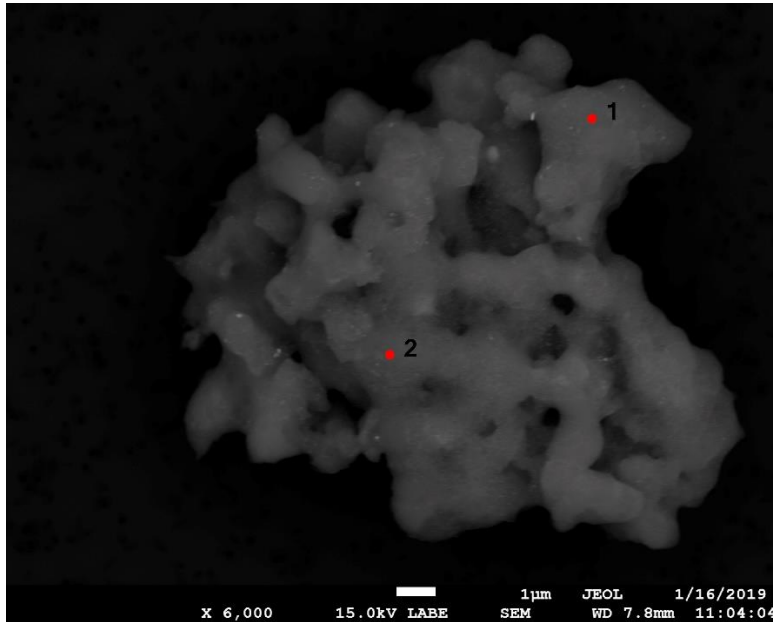
U2170 B15 - EDS Spectra

Figure 1. EDS spectra for sample U2170-B15 taken at test area 1. The test area is labeled in the particle SEM photo.

U2170 B16



Particle Size: 15 µm
Shape: Equidimensional
Transparency: Opaque
Color: BLACK
Luster: Pearly to Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2170 Cluster 16
Comments:

SEM photo of sample U2170-B16 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 16

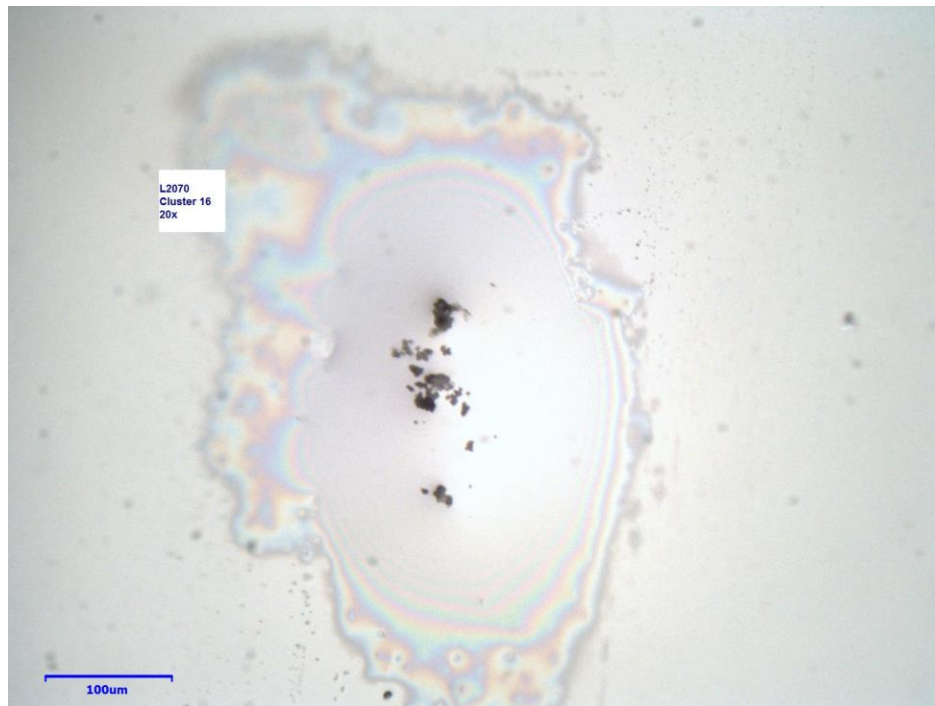


Photo of cluster U2170 Cluster 16.

U2170 B16 - EDS Spectra

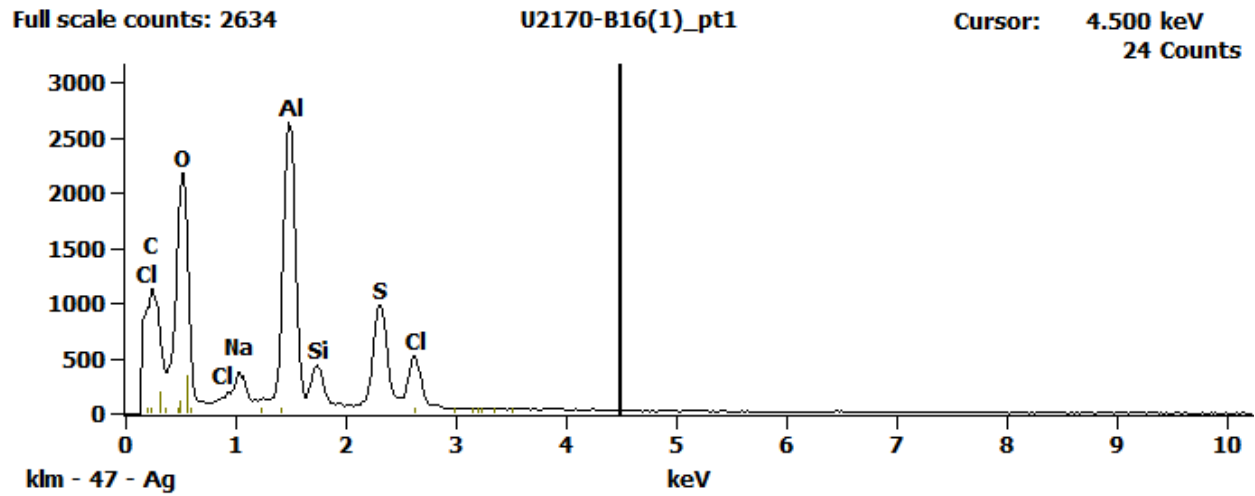


Figure 1. EDS spectra for sample U2170-B16 taken at test area 1. The test area is labeled in the particle SEM photo.

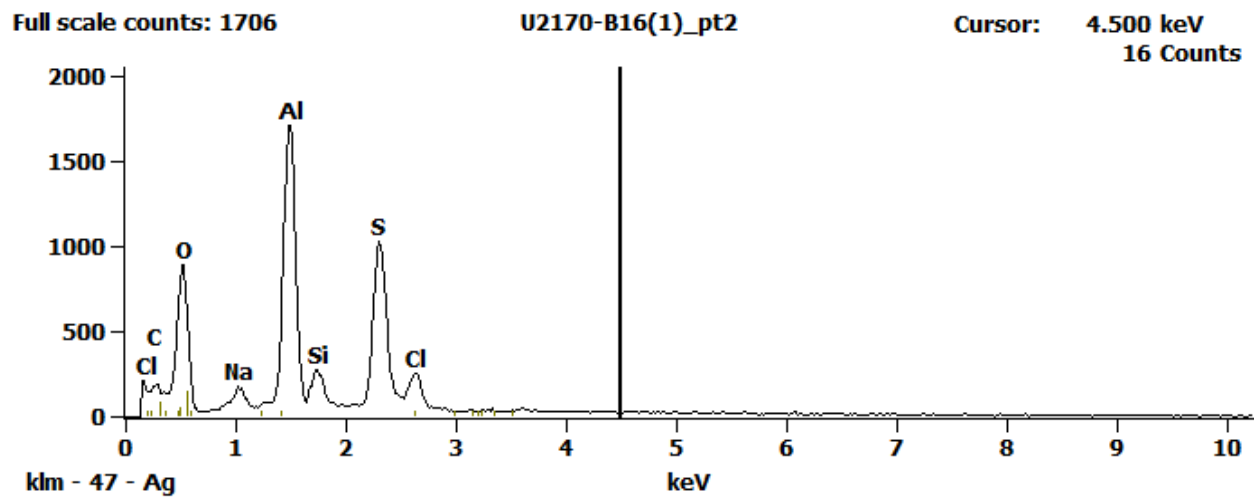
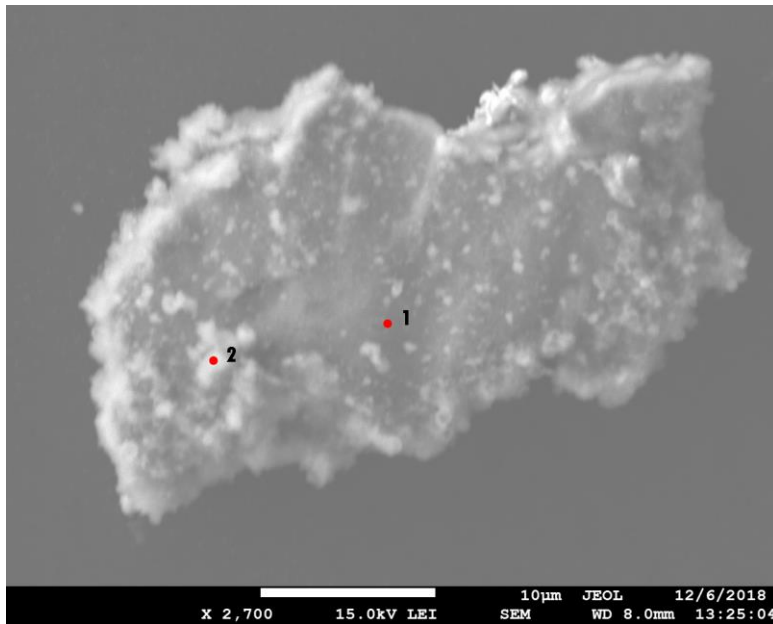


Figure 2. EDS spectra for sample U2170-B16 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 A4



Particle Size:	35x20 µm
Shape:	Irregular to Equidimensional
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-A4 with labeled EDS testing locations.

U2172 A4 - EDS Spectra

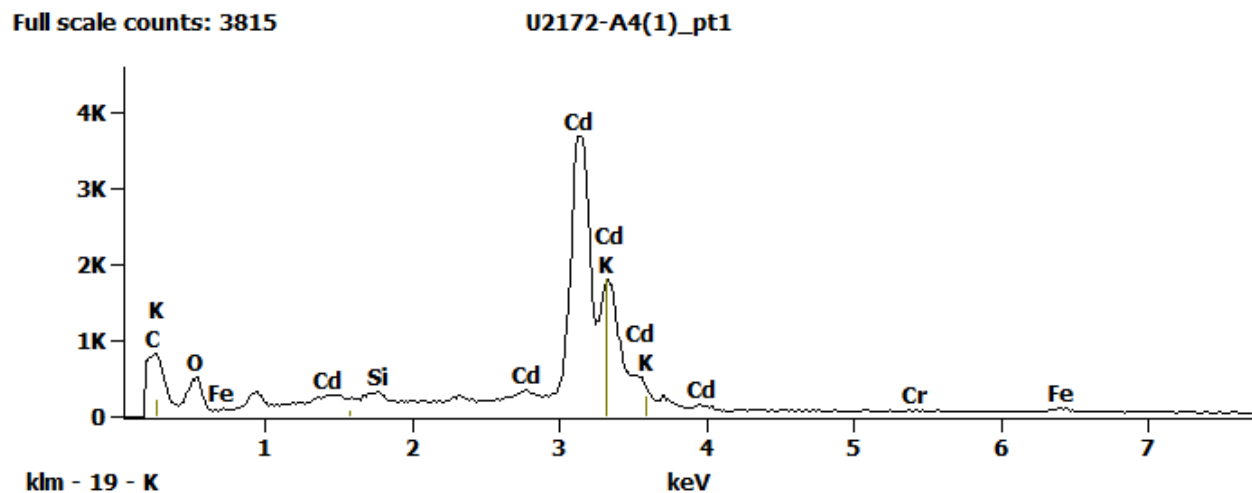


Figure 1. EDS spectra for sample U2172-A4 taken at test area 1. The test area is labeled in the particle SEM photo.

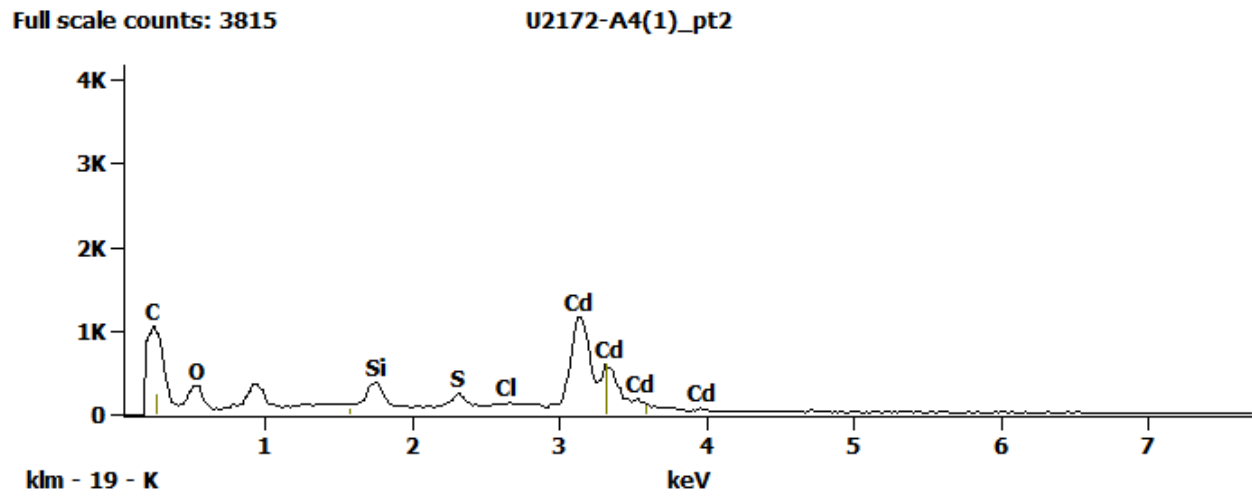
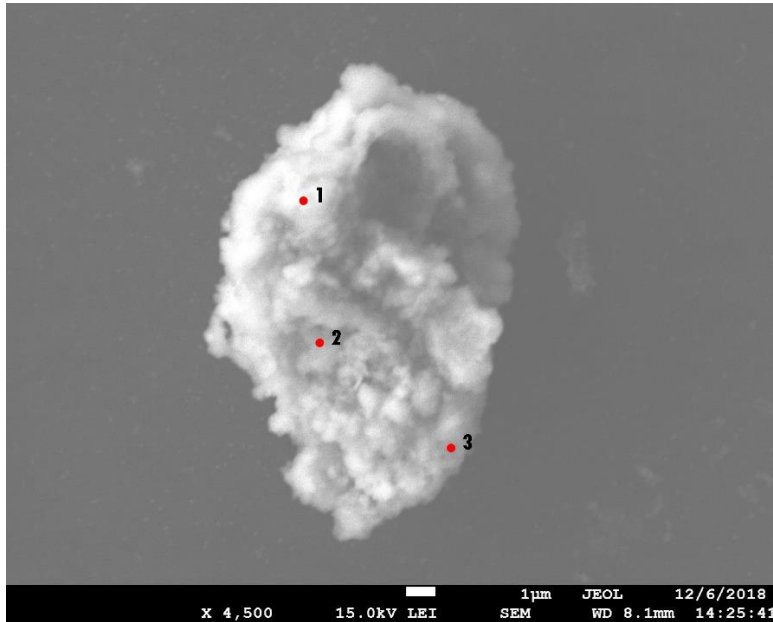


Figure 2. EDS spectra for sample U2172-A4 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 A12



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

SEM photo of sample U2172-A12 with labeled EDS testing locations.

U2172 A12 - EDS Spectra

Full scale counts: 3144

U2172-A12(1)_pt1

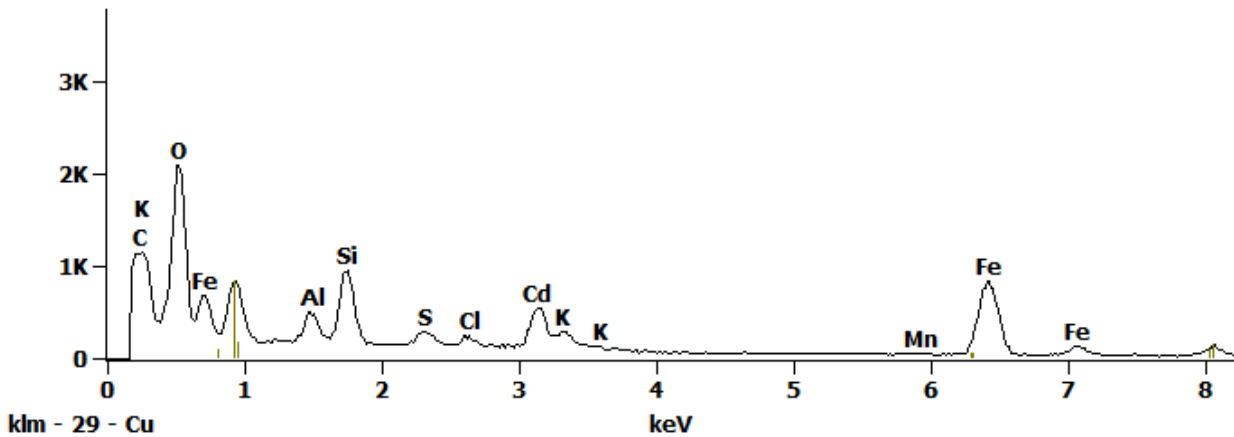


Figure 1. EDS spectra for sample U2172-A12 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 3144

U2172-A12(1)_pt2

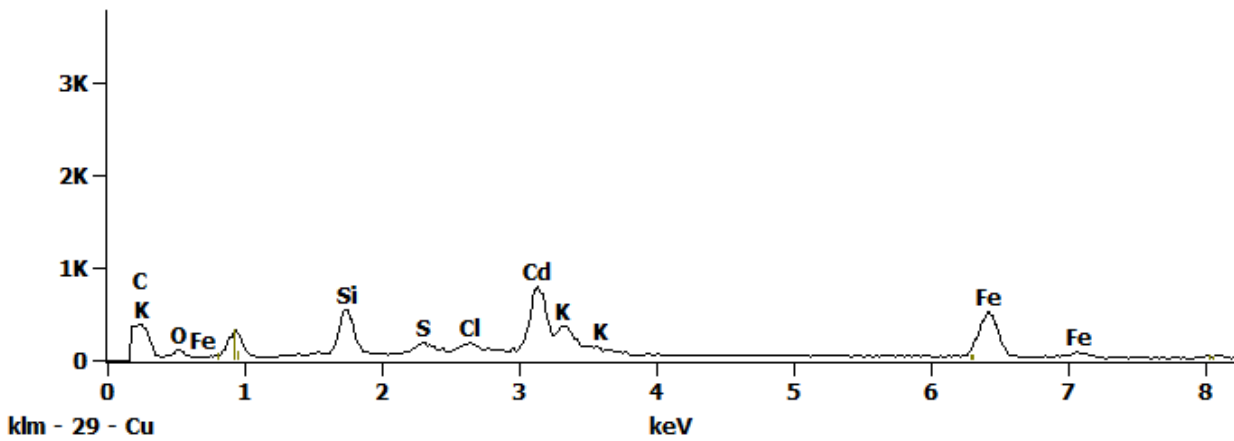


Figure 2. EDS spectra for sample U2172-A12 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 3144

U2172-A12(1)_pt3

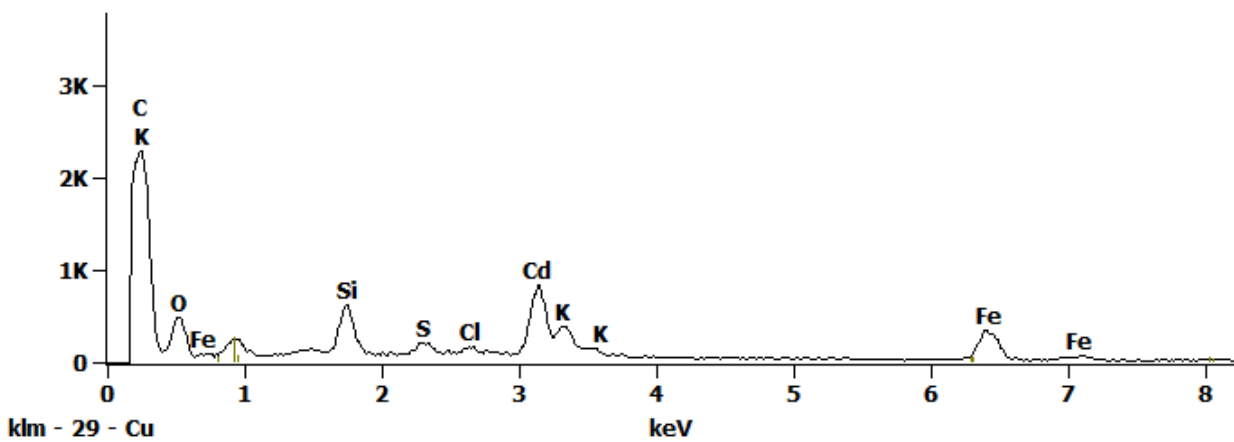
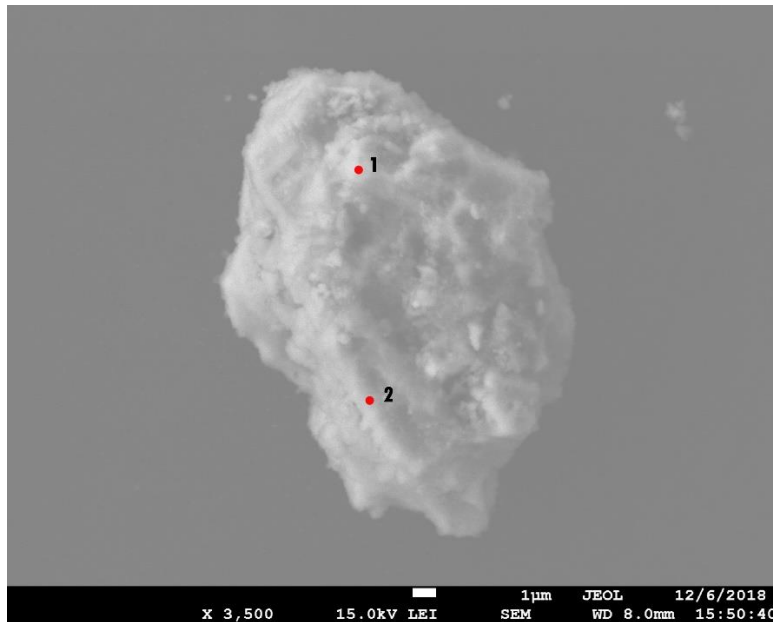


Figure 3. EDS spectra for sample U2172-A12 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A15



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

SEM photo of sample U2172-A15 with labeled EDS testing locations.

U2172 A15 - EDS Spectra

Full scale counts: 2625

U2172-A15(1)_pt1

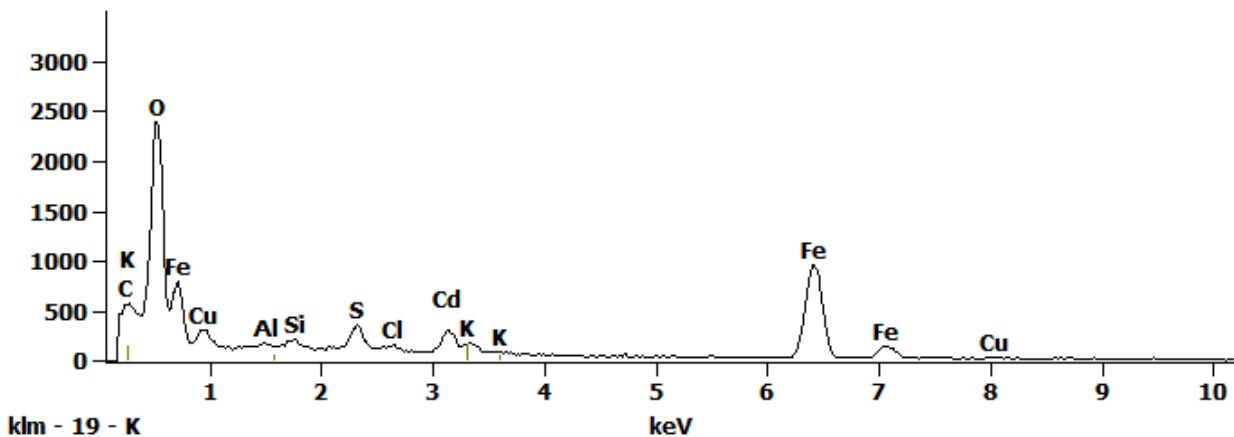


Figure 1. EDS spectra for sample U2172-A15 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 2625

U2172-A15(1)_pt2

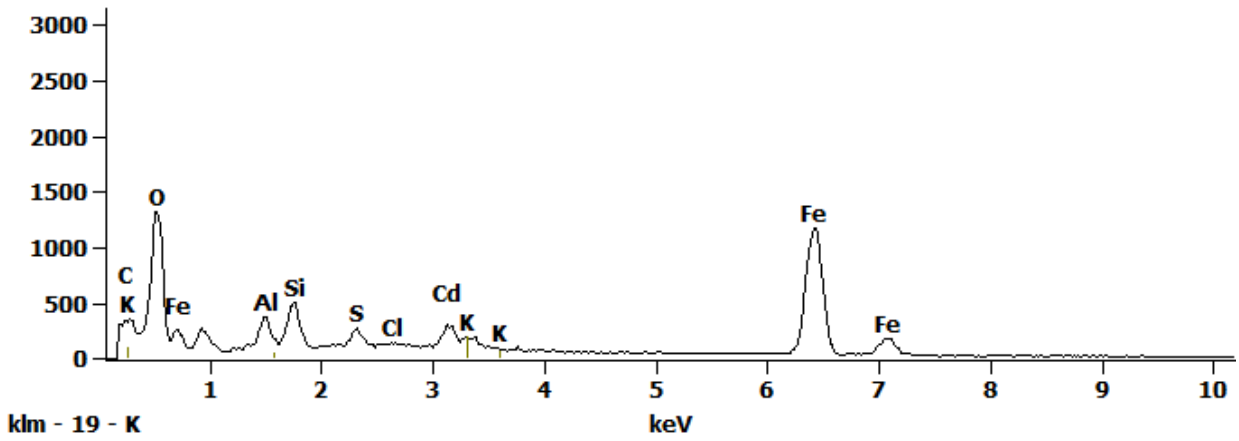
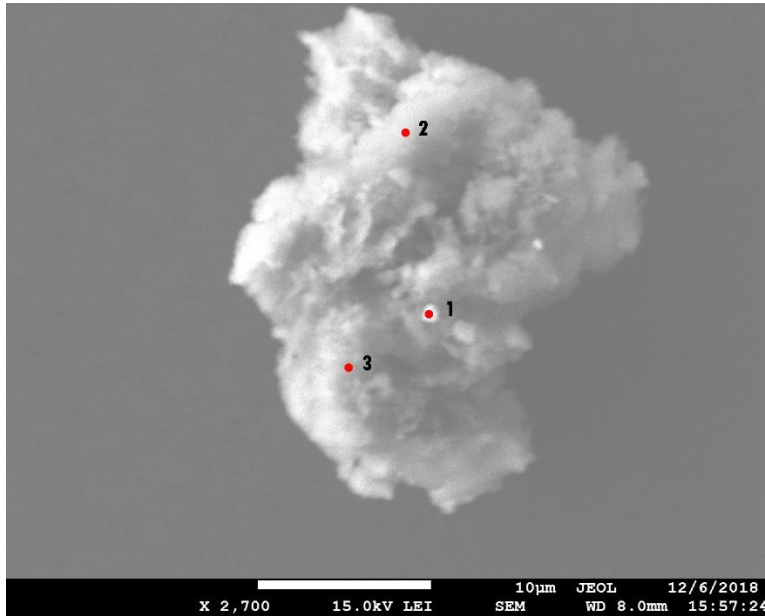


Figure 2. EDS spectra for sample U2172-A15 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 A16



Particle Size:	23 μm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-A16 with labeled EDS testing locations.

U2172 A16 - EDS Spectra

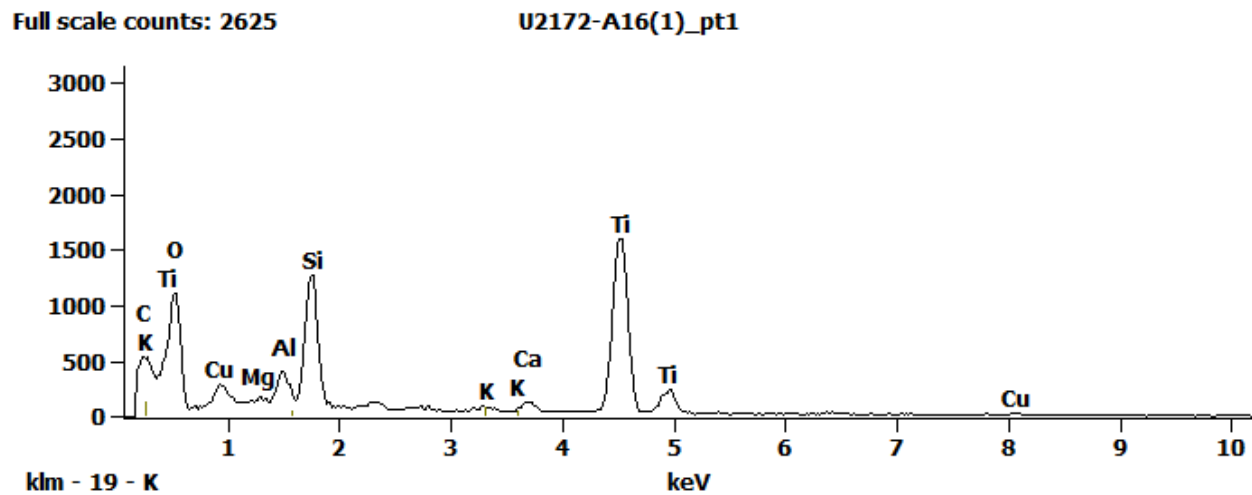


Figure 1. EDS spectra for sample U2172-A16 taken at test area 1. The test area is labeled in the particle SEM photo.

Full scale counts: 2625

U2172-A16(1)_pt2

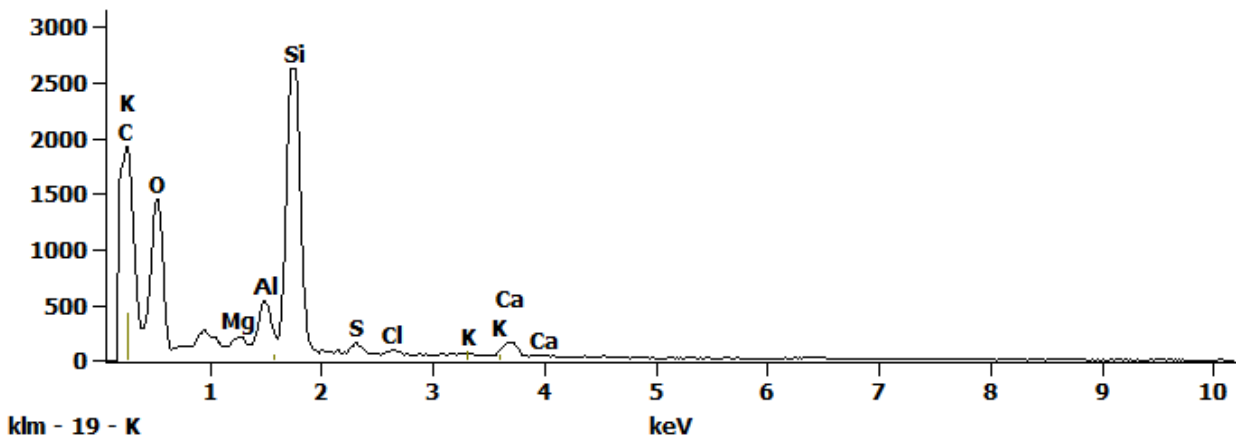


Figure 2. EDS spectra for sample U2172-A16 taken at test area 2. The test area is labeled in the particle SEM photo.

Full scale counts: 2625

U2172-A16(1)_pt3

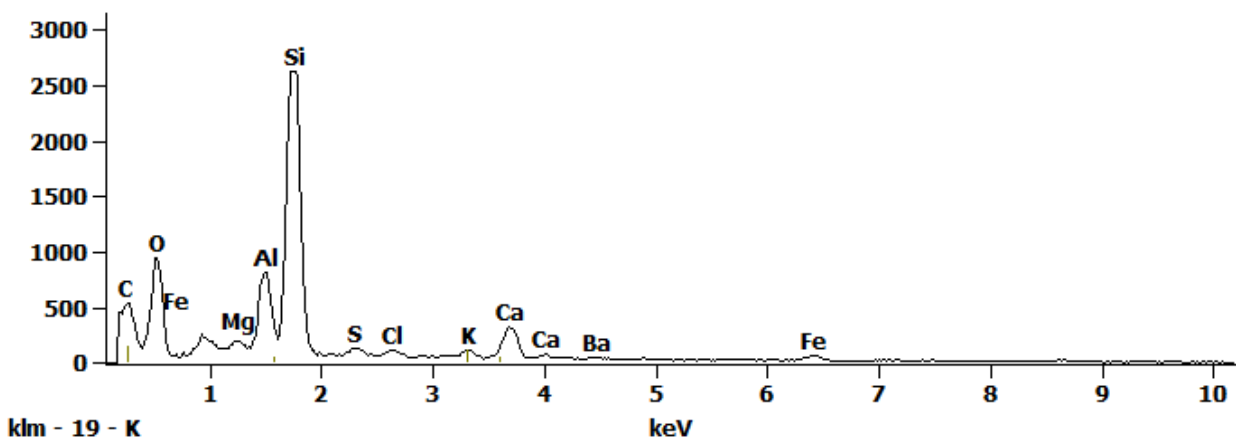
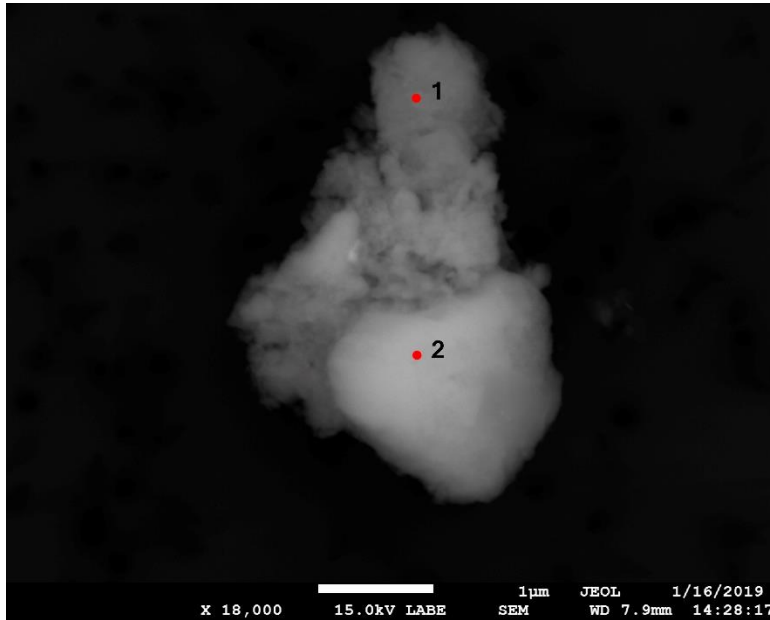


Figure 3. EDS spectra for sample U2172-A16 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B1



Particle Size:	5 µm
Shape:	Equidimensional
Transparency:	Translucent to Transparent
Color:	GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 1
Comments:	

SEM photo of sample U2172-B1 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 1

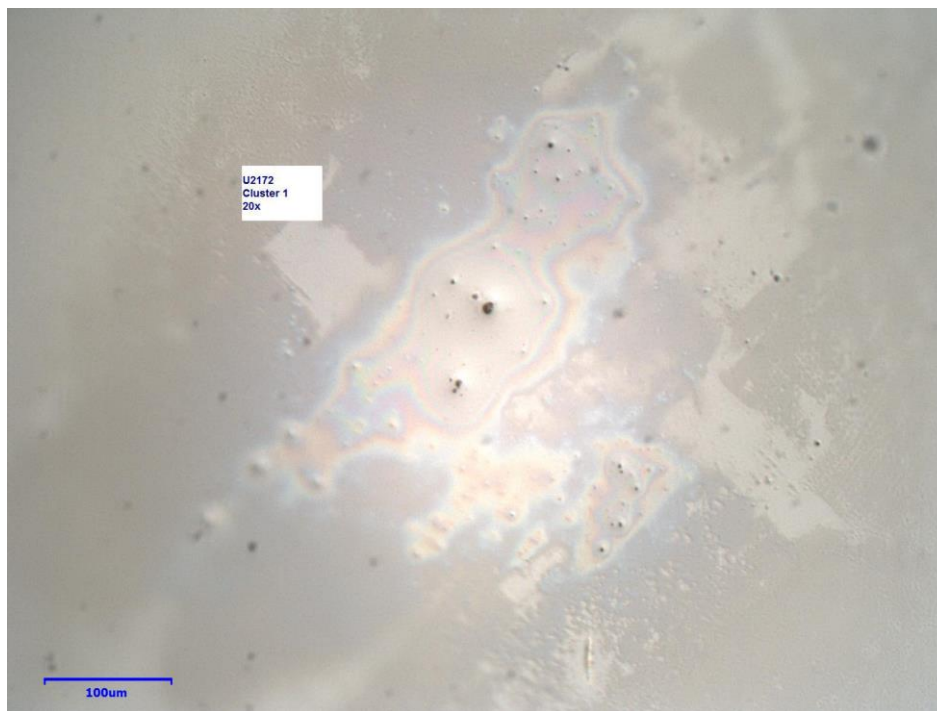


Photo of cluster U2172 Cluster 1.

U2172 B1 - EDS Spectra

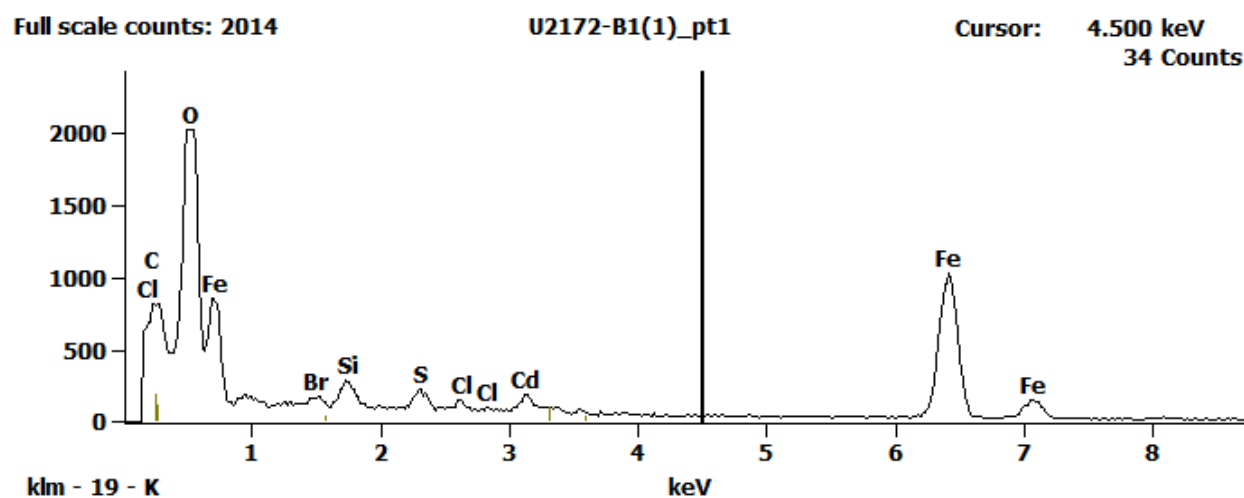


Figure 1. EDS spectra for sample U2172-B1 taken at test area 1. The test area is labeled in the particle SEM photo.

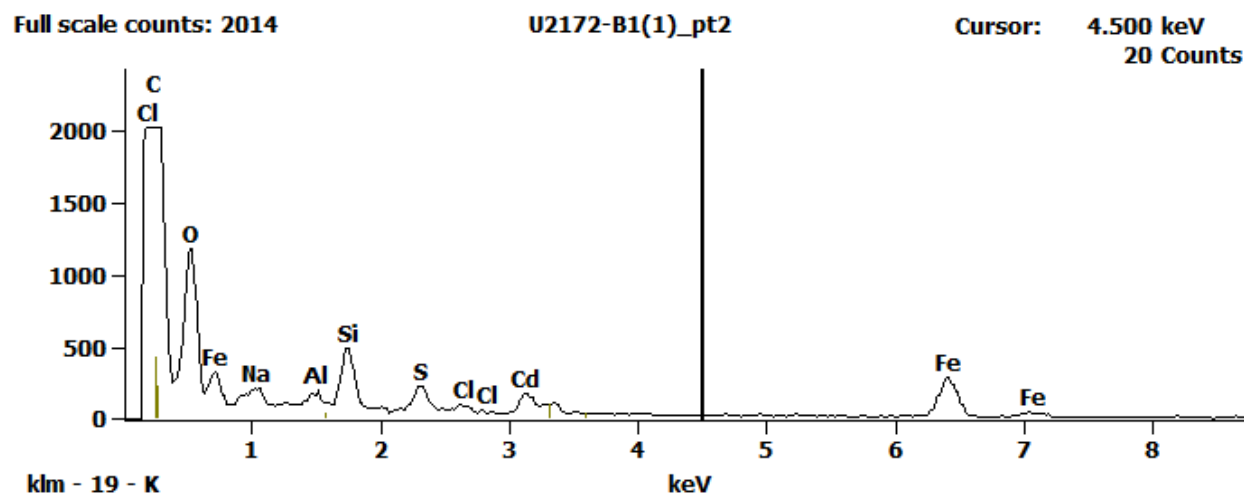
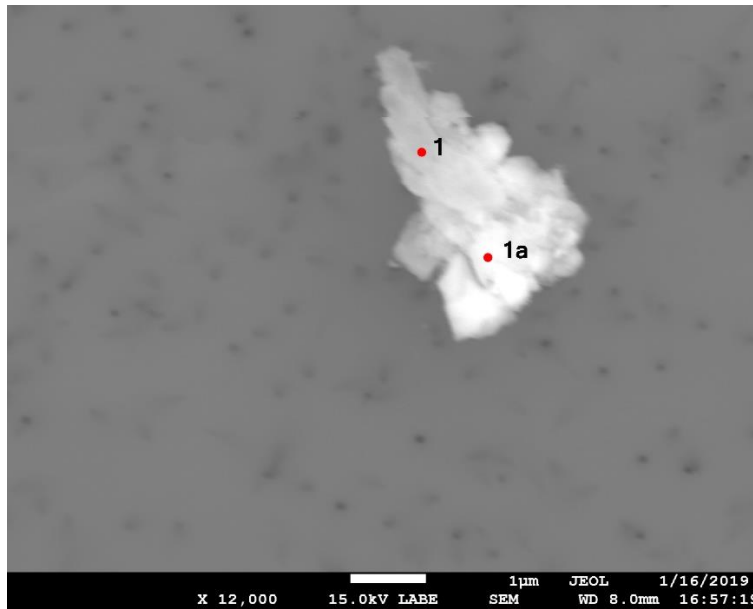


Figure 2. EDS spectra for sample U2172-B1 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B2



SEM photo of sample U2172-B2 with labeled EDS testing locations.

Particle Size:	5 µm
Shape:	Equidimensional
Transparency:	Translucent to Opaque
Color:	GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 1
Comments:	

Cluster of Origin: U2172 Cluster 1

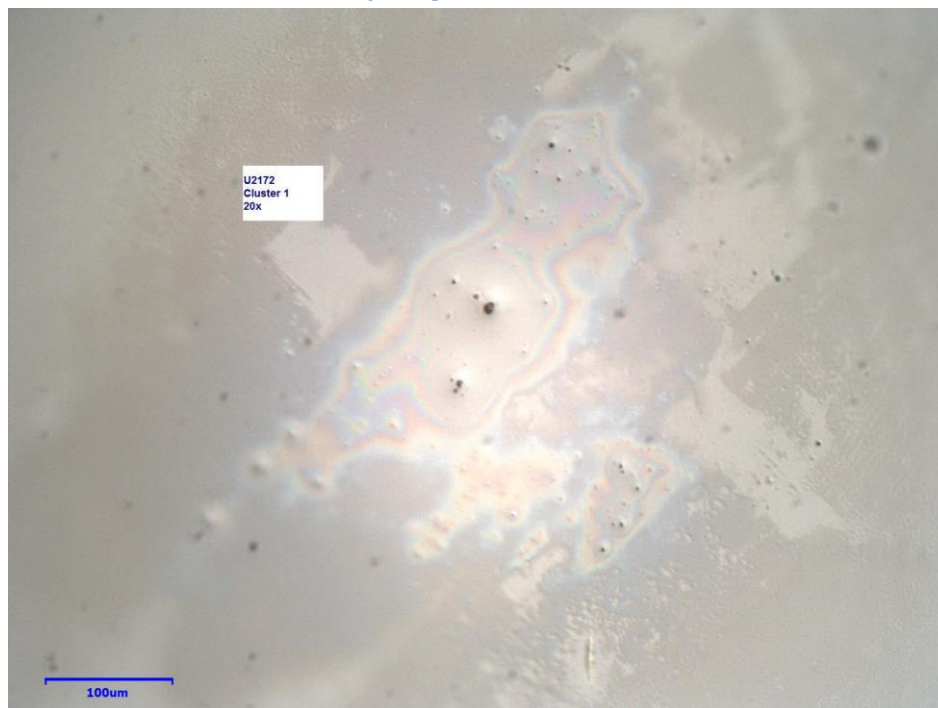


Photo of cluster U2172 Cluster 1.

U2172 B2 - EDS Spectra

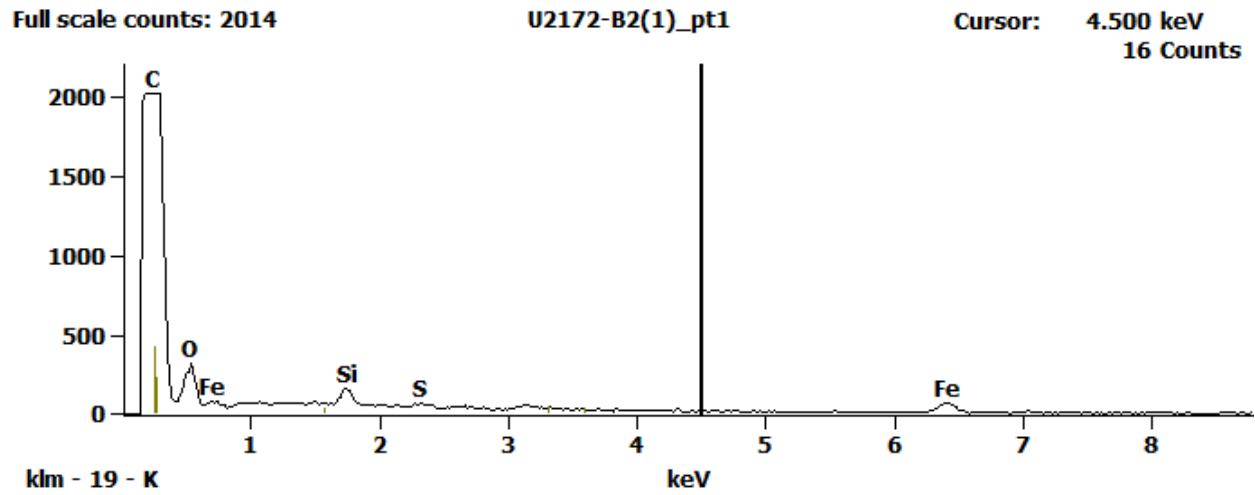


Figure 1. EDS spectra for sample U2172-B2 taken at test area 1. The test area is labeled in the particle SEM photo.

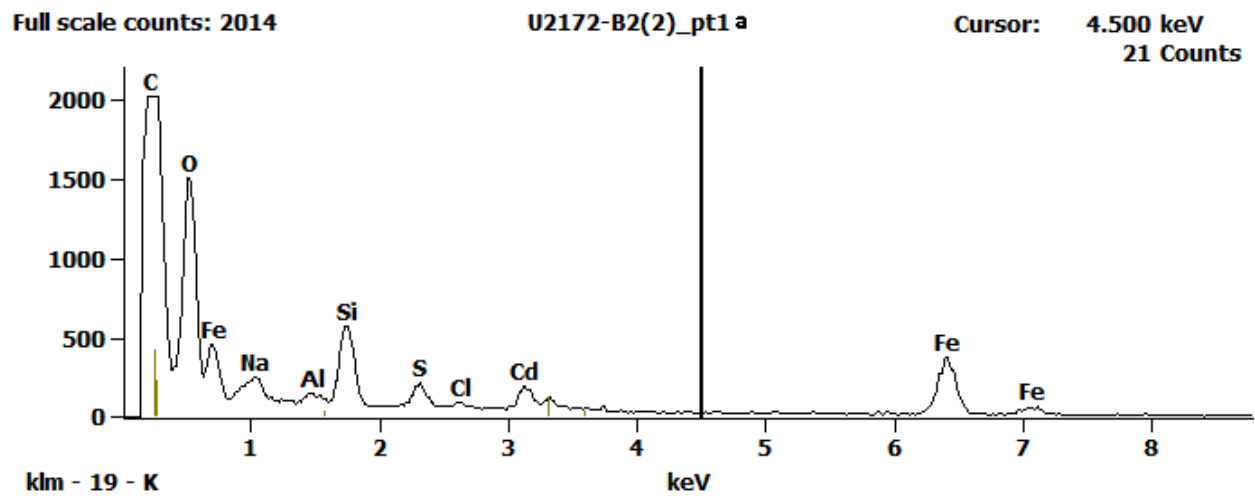
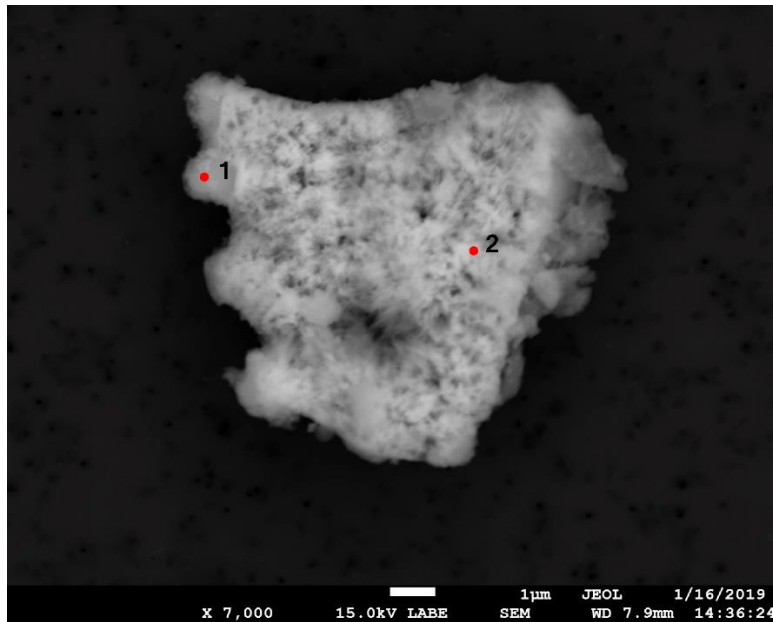


Figure 2. EDS spectra for sample U2172-B2 taken at test area 1a. The test area is labeled in the particle SEM photo.

U2172 B3



Particle Size:	10 μm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Resinous to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 2
Comments:	

SEM photo of sample U2172-B3 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 2

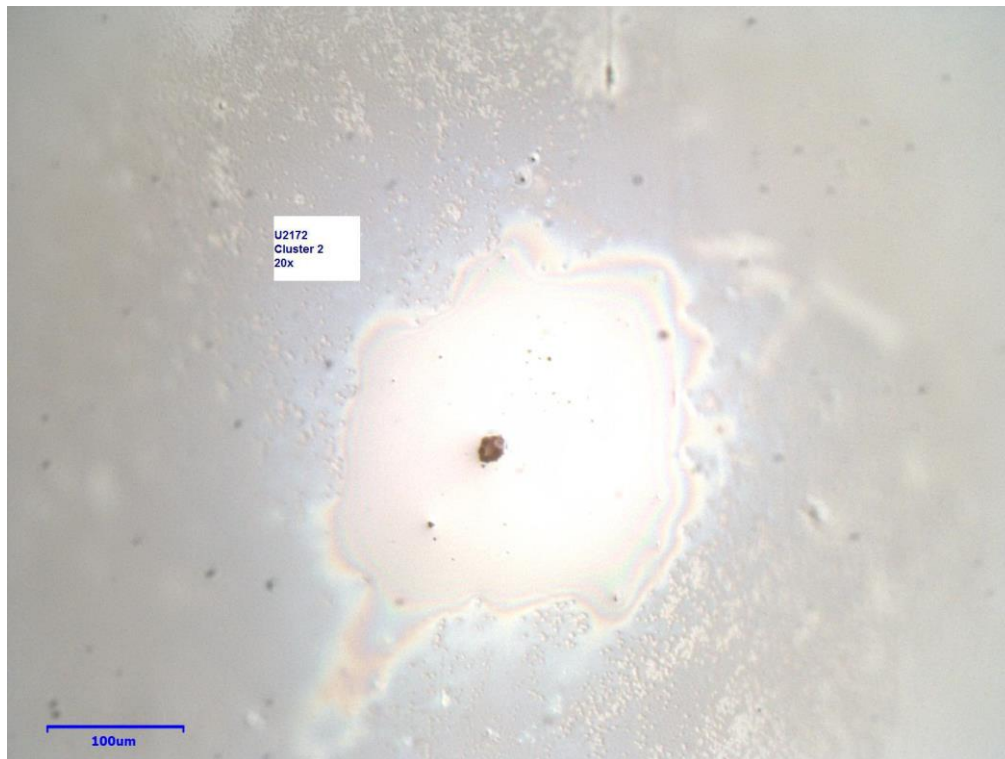


Photo of cluster U2172 Cluster 2.

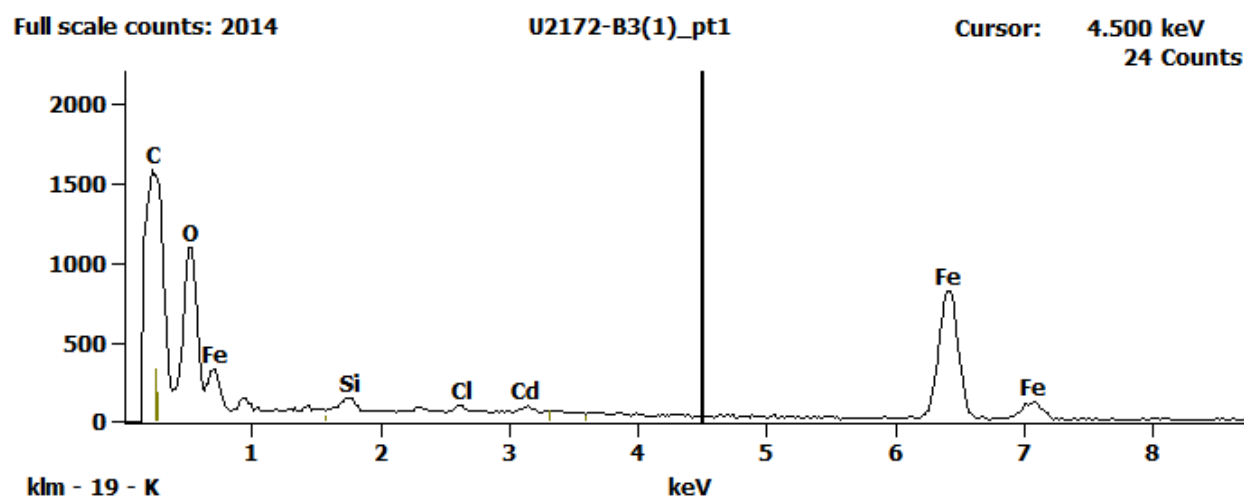
U2172 B3 - EDS Spectra

Figure 1. EDS spectra for sample U2172-B3 taken at test area 1. The test area is labeled in the particle SEM photo.

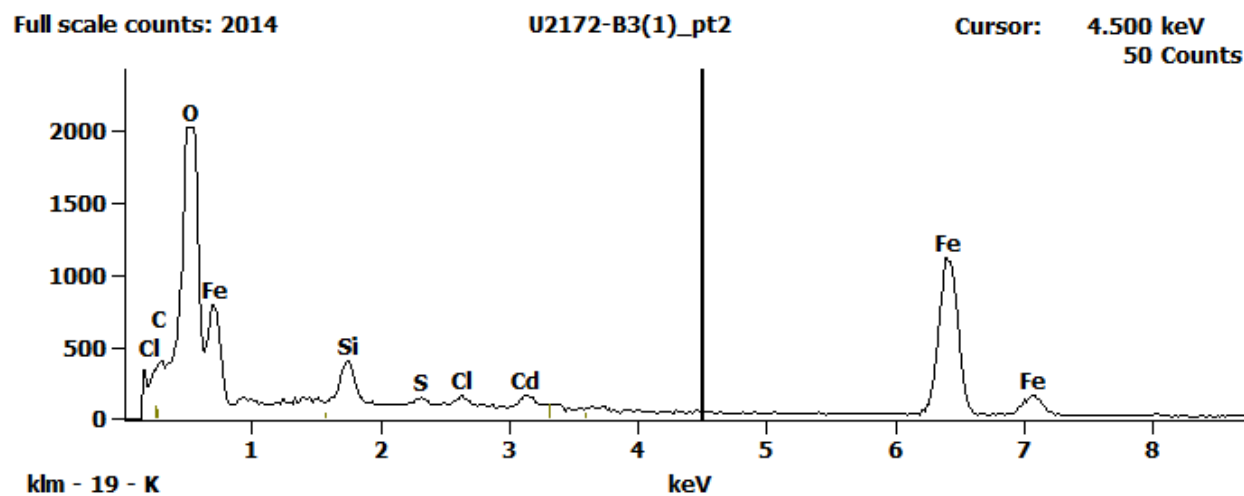
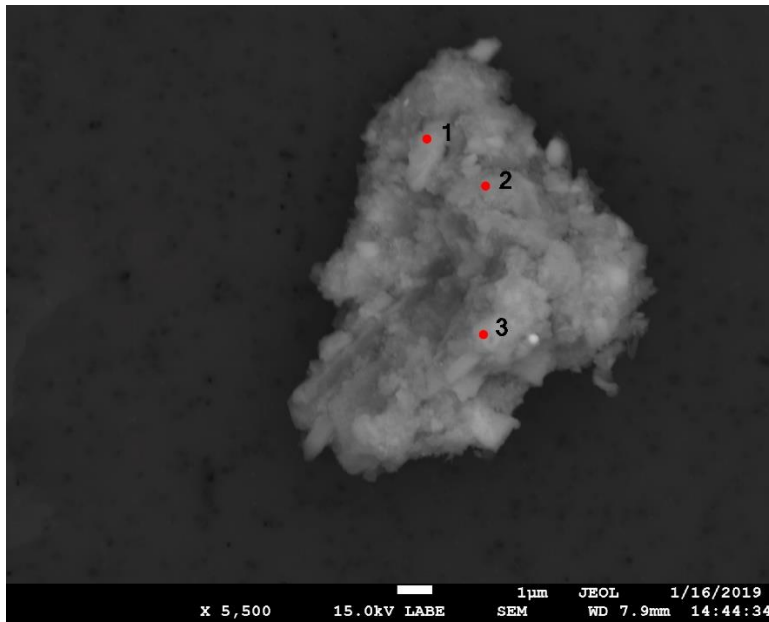


Figure 2. EDS spectra for sample U2172-B3 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B4



Particle Size:	15 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Resinous to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 2
Comments:	

SEM photo of sample U2172-B4 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 2

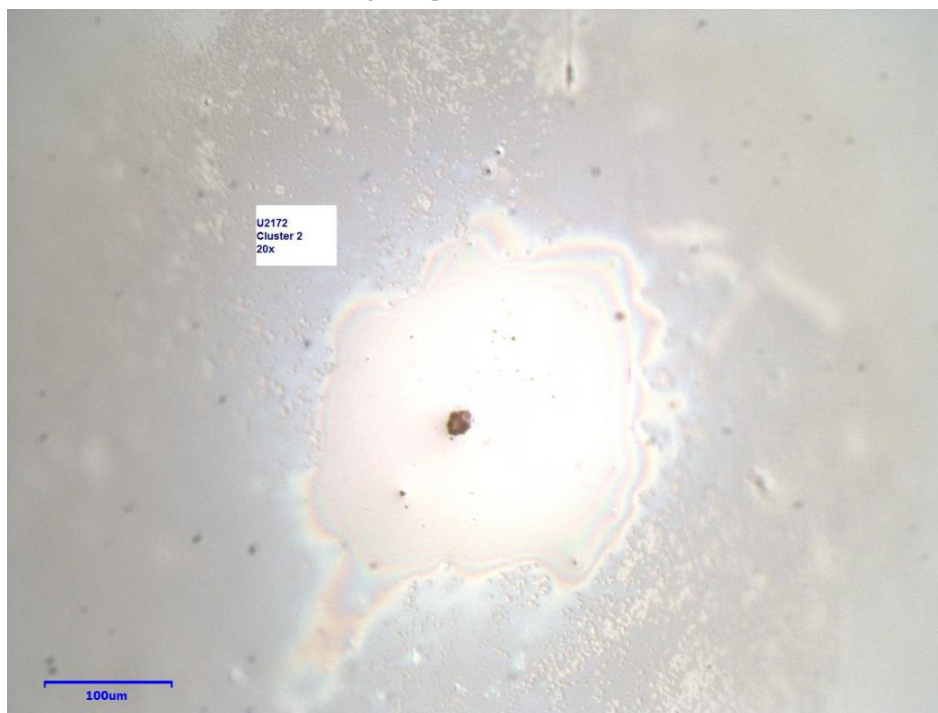


Photo of cluster U2172 Cluster 2.

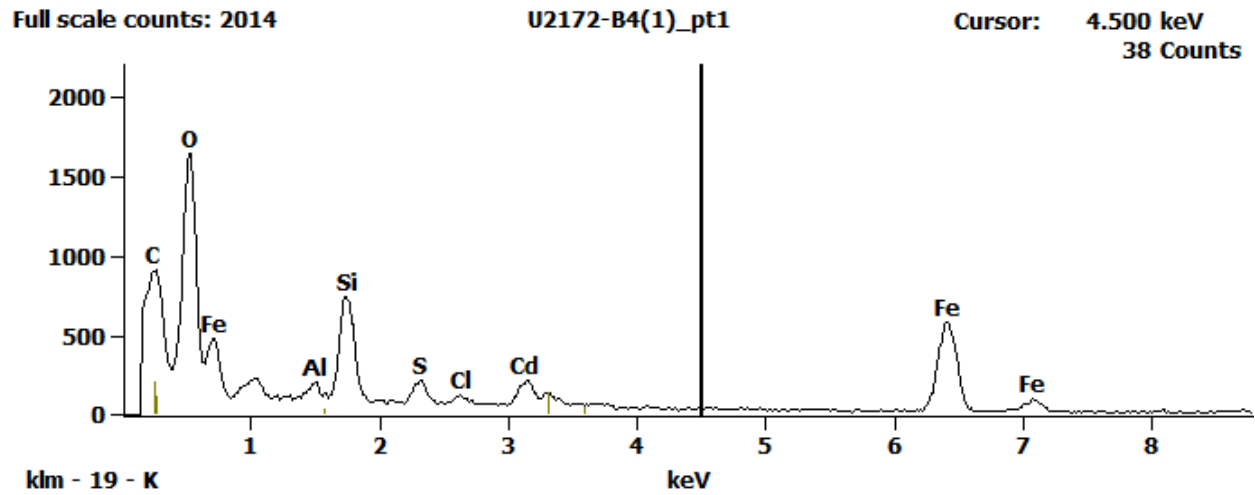
U2172 B4 - EDS Spectra

Figure 1. EDS spectra for sample U2172-B4 taken at test area 1. The test area is labeled in the particle SEM photo.

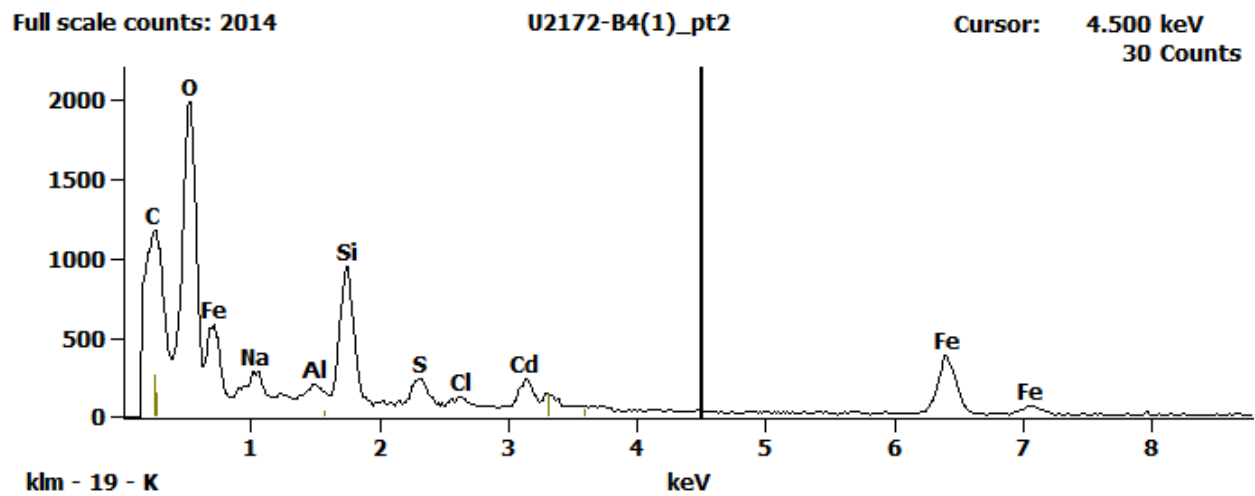


Figure 2. EDS spectra for sample U2172-B4 taken at test area 2. The test area is labeled in the particle SEM photo.

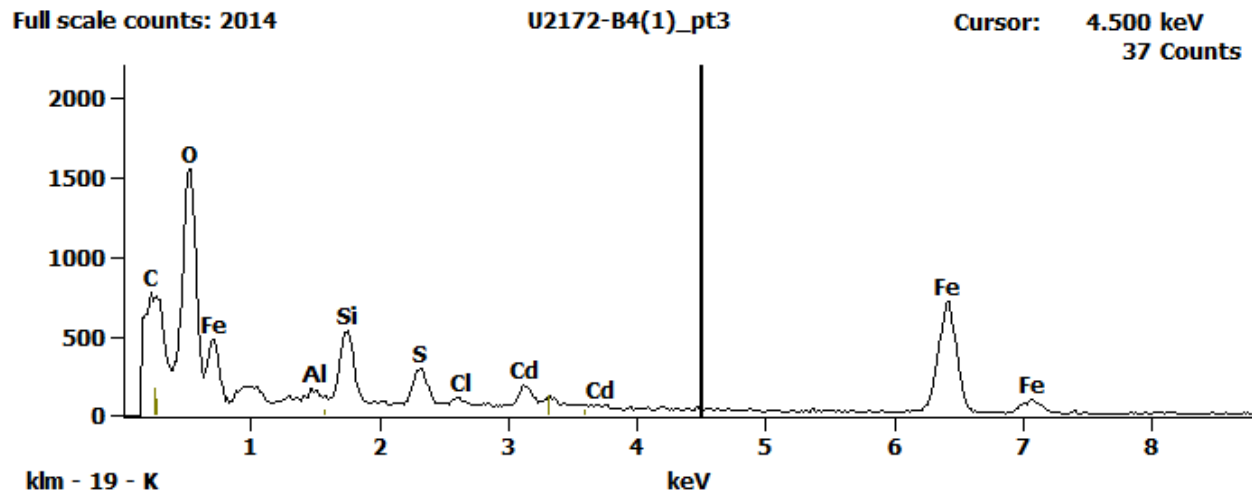
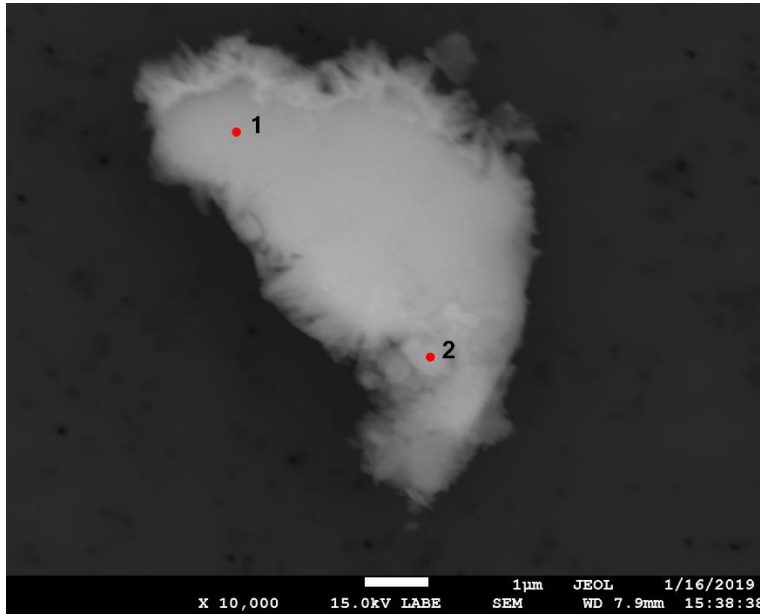


Figure 3. EDS spectra for sample U2172-B4 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B5



Particle Size:	10 µm
Shape:	Irregular
Transparency:	Opaque
Color:	CLEAR, AMBER
Luster:	Resinous to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 3
Comments:	

SEM photo of sample U2172-B5 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 3

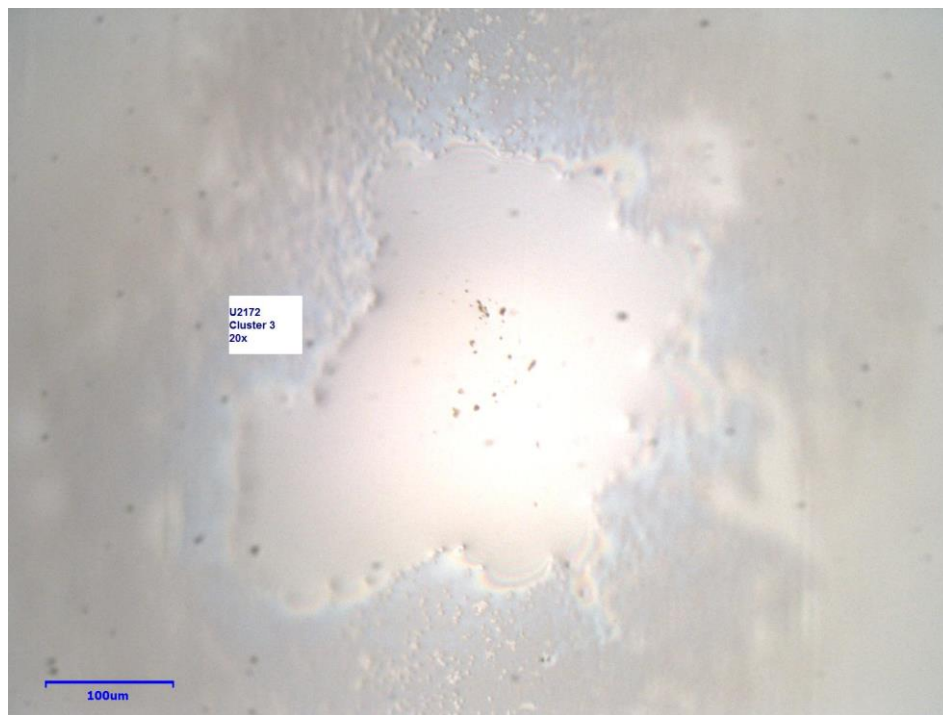


Photo of cluster U2172 Cluster 3.

U2172 B5 - EDS Spectra

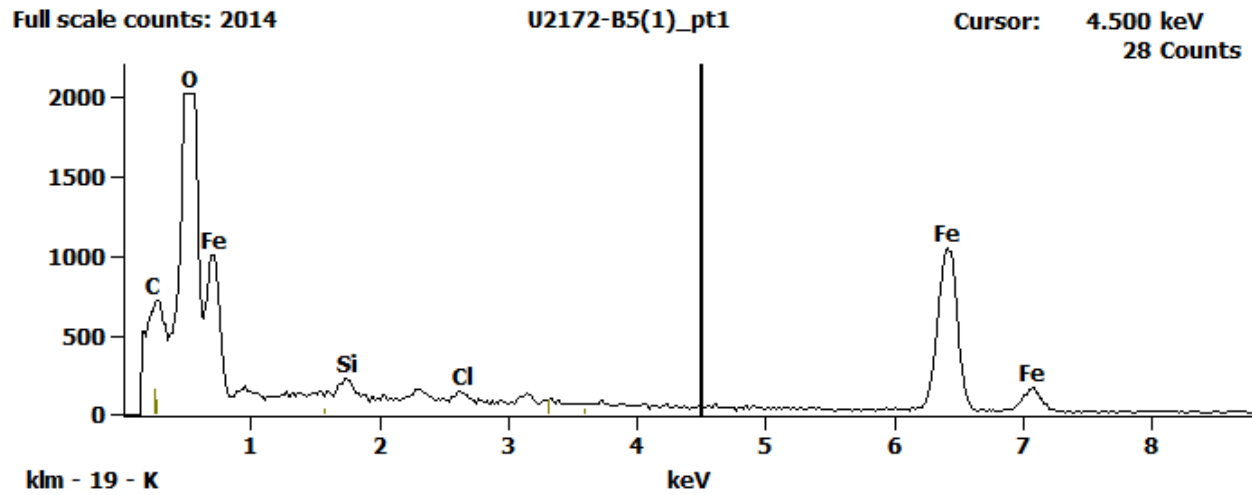


Figure 1. EDS spectra for sample U2172-B5 taken at test area 1. The test area is labeled in the particle SEM photo.

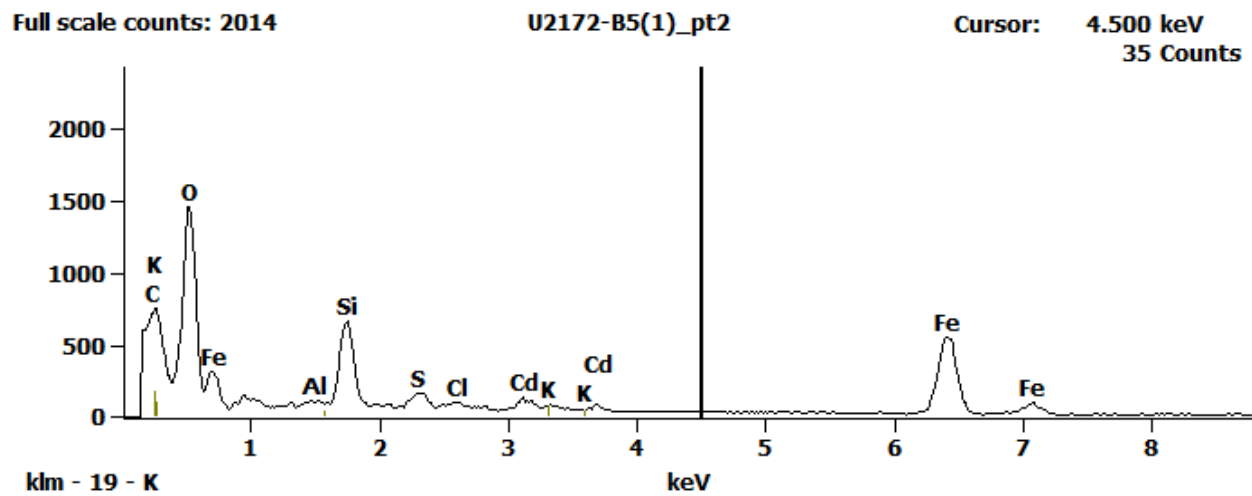
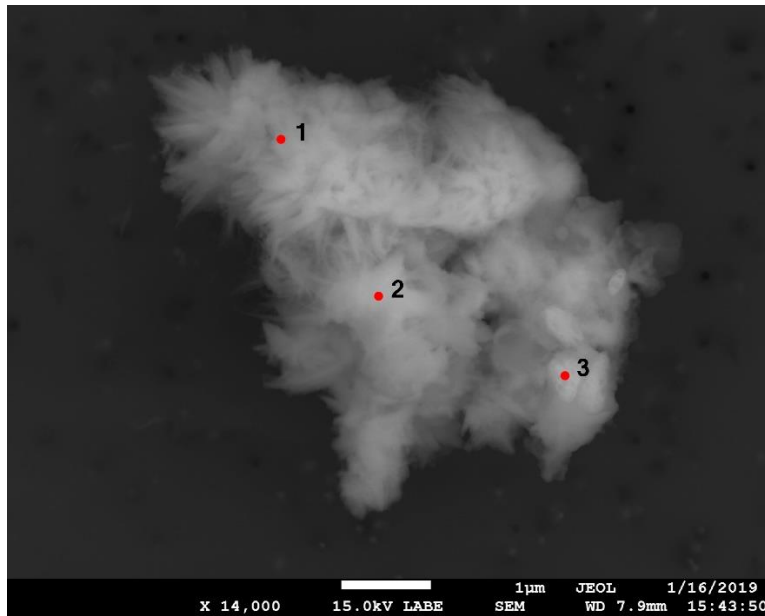


Figure 2. EDS spectra for sample U2172-B5 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B6



Particle Size:	6 µm
Shape:	Irregular
Transparency:	Opaque
Color:	AMBER, CLEAR
Luster:	Resinous to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 3
Comments:	

SEM photo of sample U2172-B6 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 3

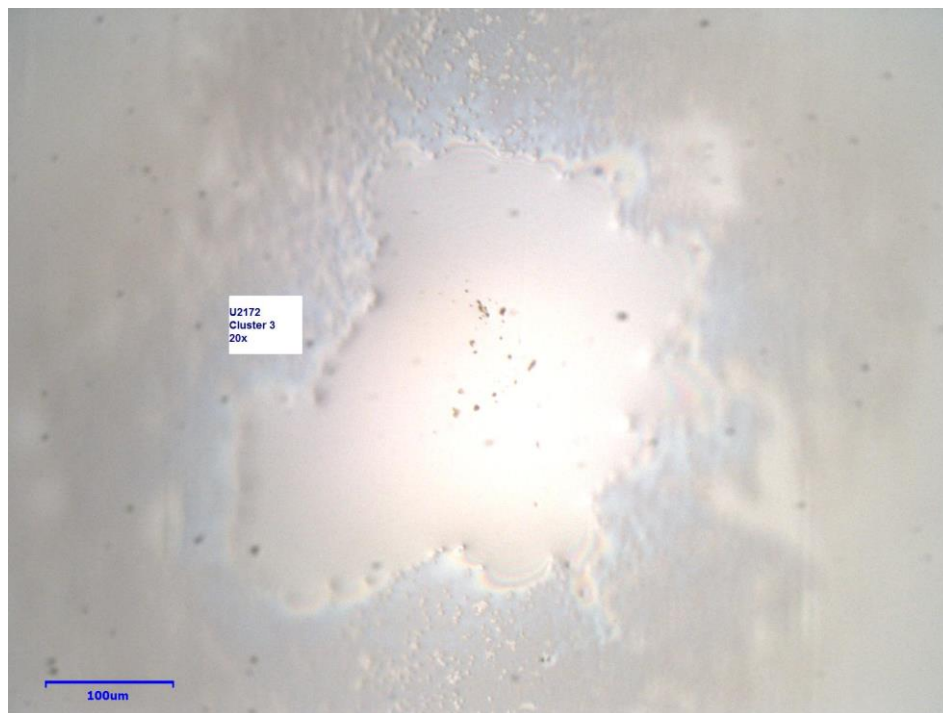


Photo of cluster U2172 Cluster 3.

U2172 B6 - EDS Spectra

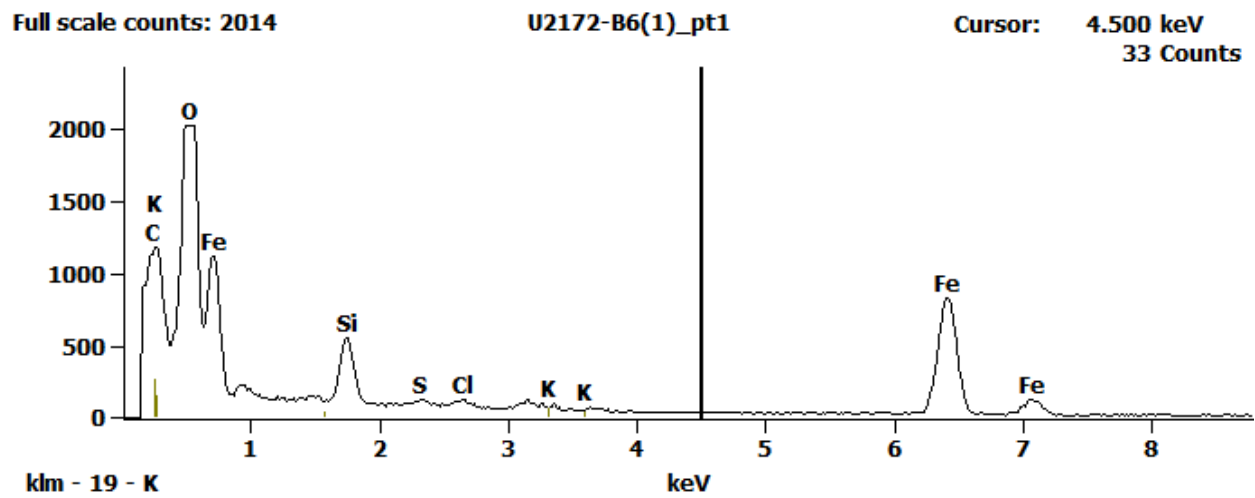


Figure 1. EDS spectra for sample U2172-B6 taken at test area 1. The test area is labeled in the particle SEM photo.

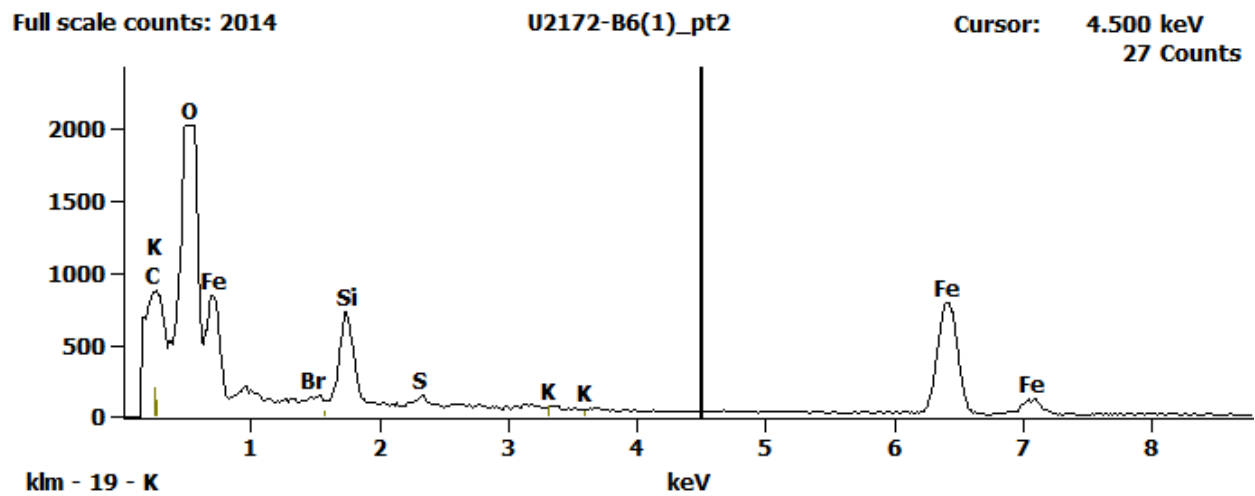


Figure 2. EDS spectra for sample U2172-B6 taken at test area 2. The test area is labeled in the particle SEM photo.

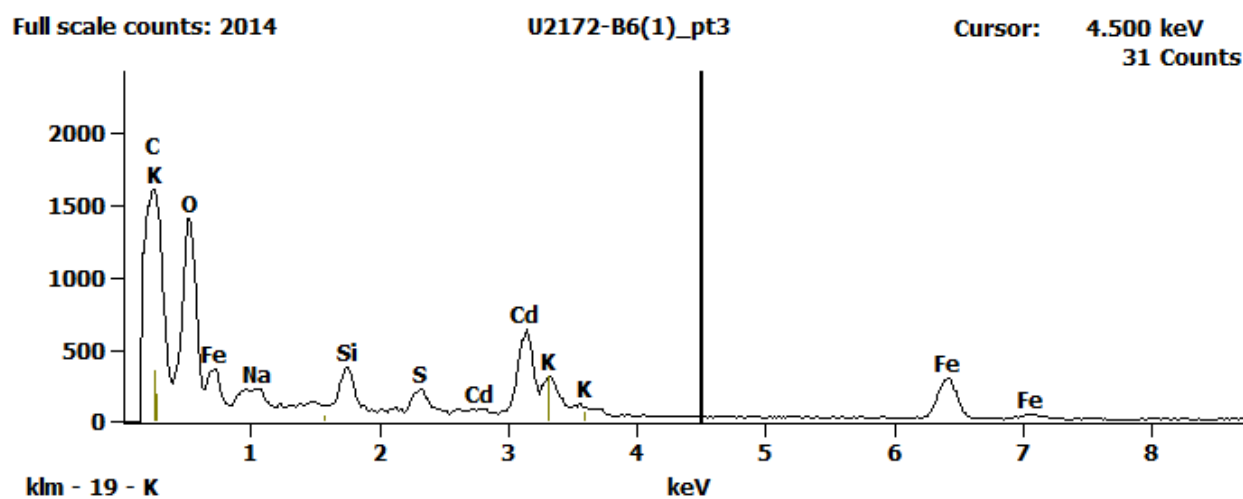
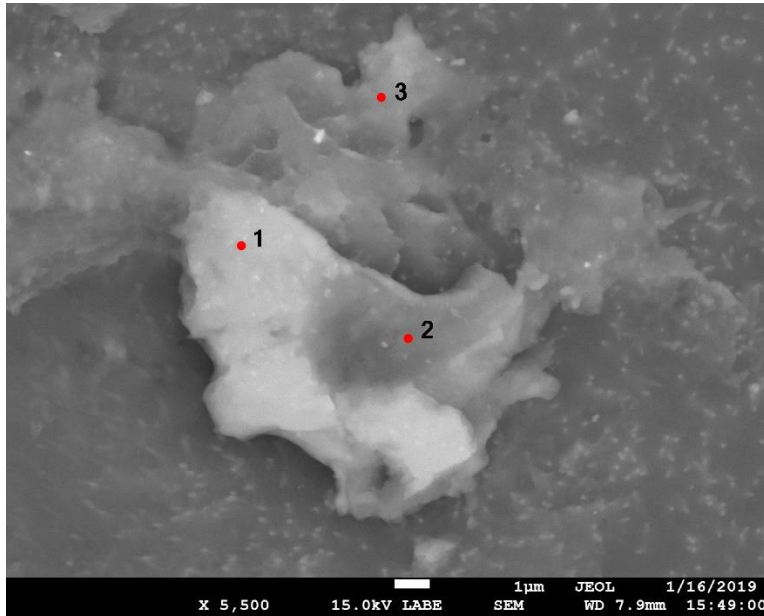


Figure 3. EDS spectra for sample U2172-B6 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B7



Particle Size: 10x5 µm
Shape: Irregular
Transparency: Opaque
Color: BLACK, GRAY
Luster: Dull
Particle Type: ARTIFICIAL
TERRESTRIAL
CONTAMINATION
Cluster No.: U2172 Cluster 4
Comments:

SEM photo of sample U2172-B7 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 4

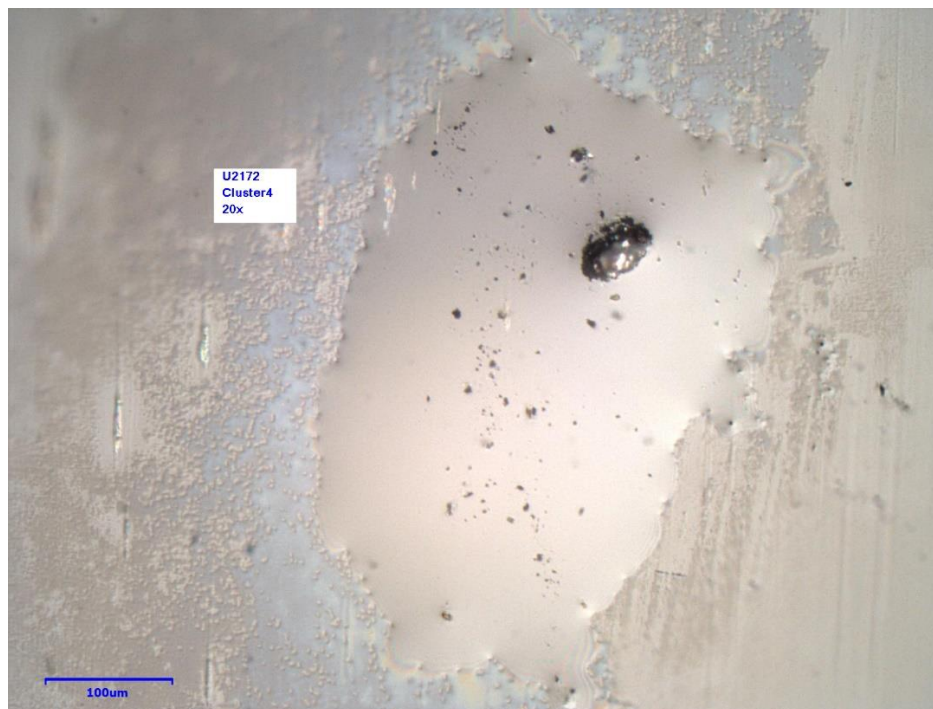


Photo of cluster U2172 Cluster 4.

U2172 B7 - EDS Spectra

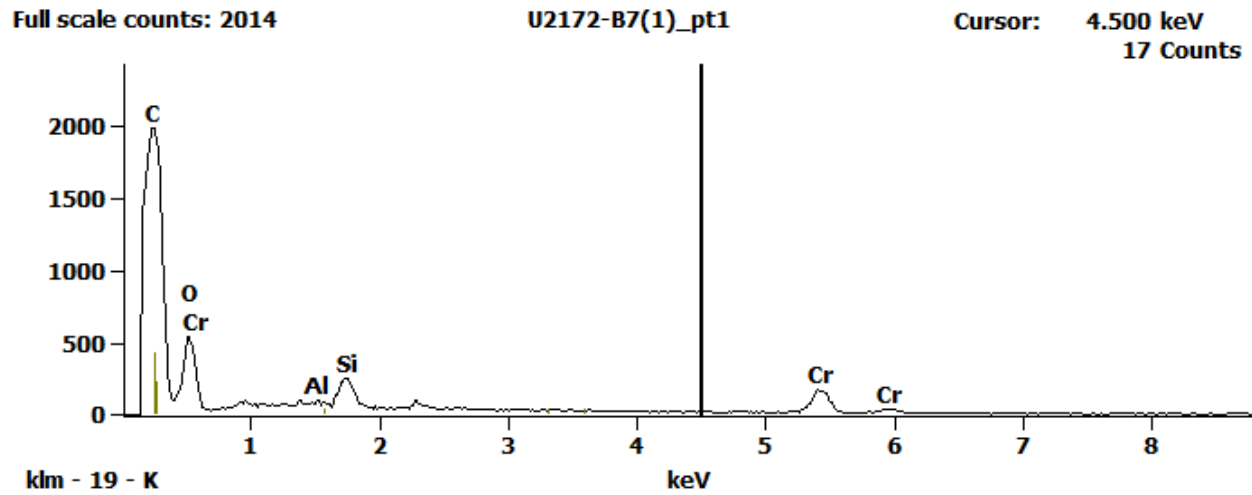


Figure 1. EDS spectra for sample U2172-B7 taken at test area 1. The test area is labeled in the particle SEM photo.

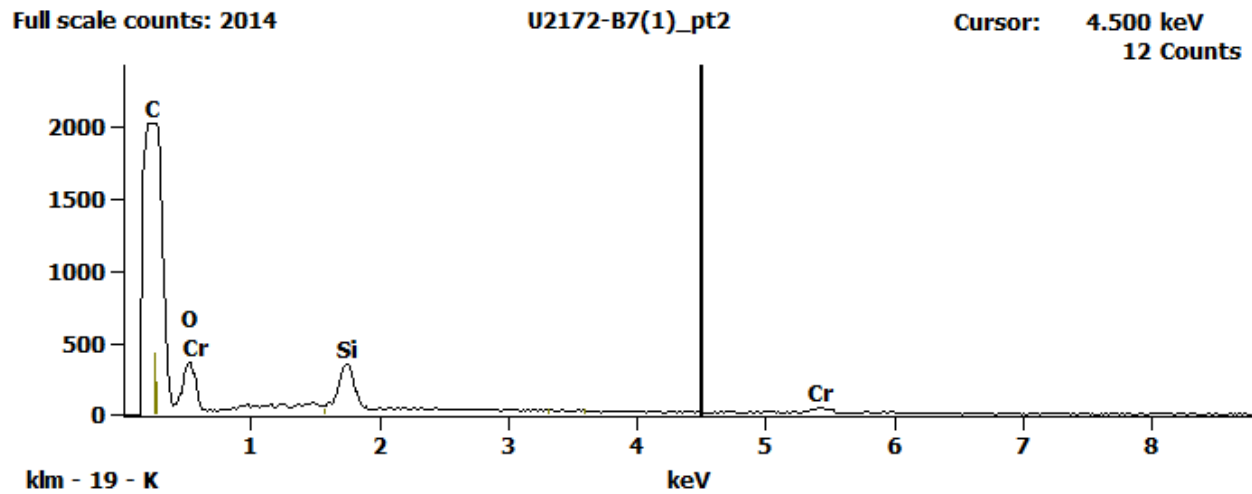


Figure 2. EDS spectra for sample U2172-B7 taken at test area 2. The test area is labeled in the particle SEM photo.

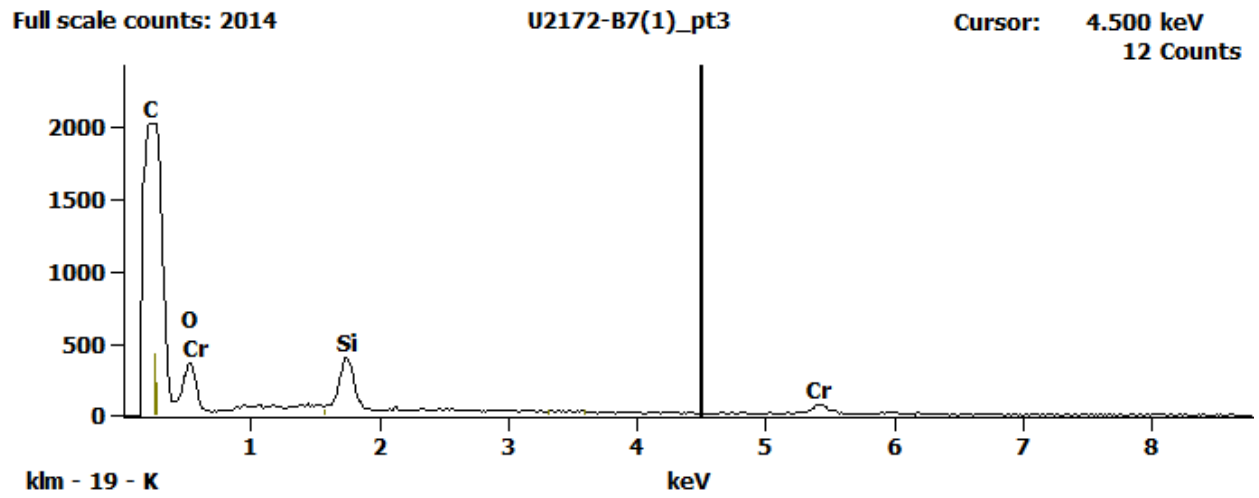
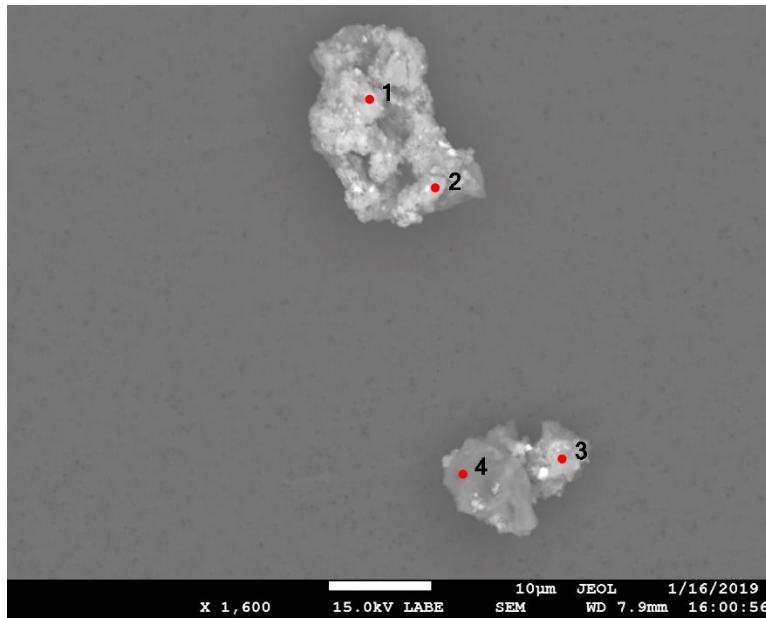


Figure 3. EDS spectra for sample U2172-B7 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B9



Particle Size:	22 µm and 15 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 5
Comments:	

SEM photo of sample U2172-B9 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 5

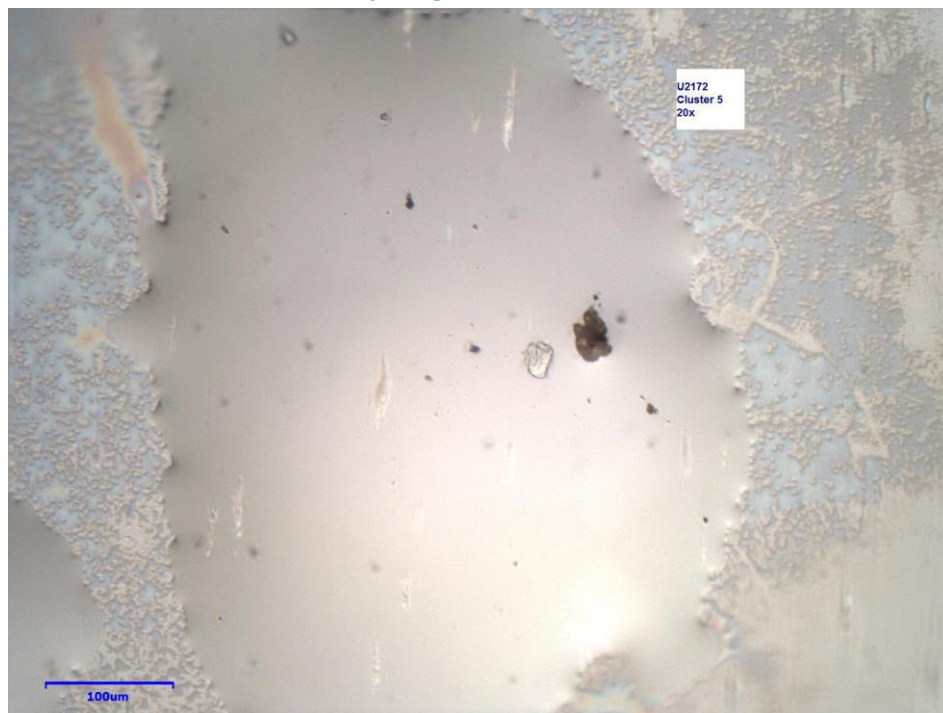


Photo of cluster U2172 Cluster 5.

U2172 B9 - EDS Spectra

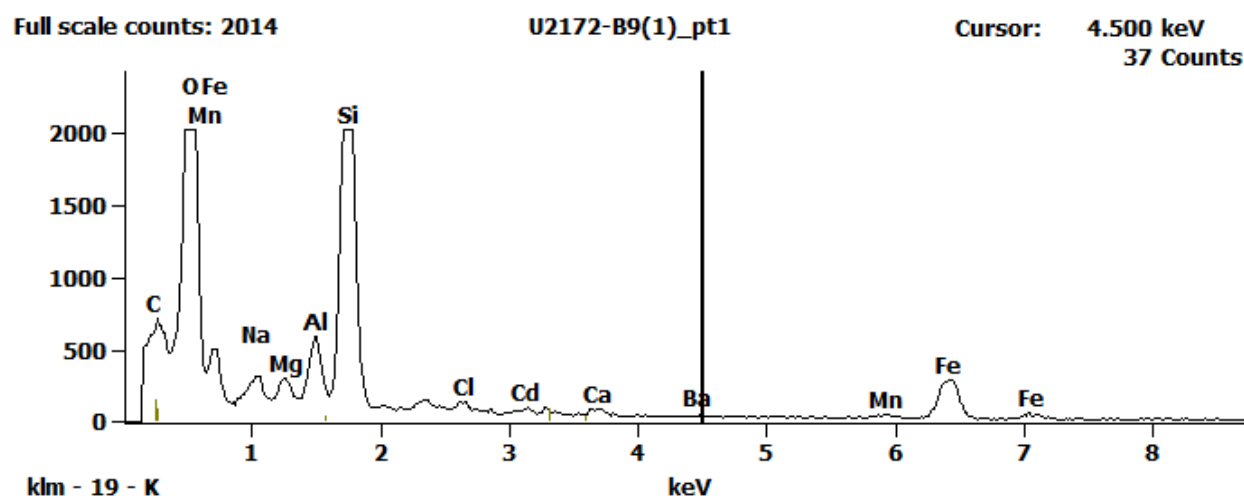


Figure 1. EDS spectra for sample U2172-B9 taken at test area 1. The test area is labeled in the particle SEM photo.

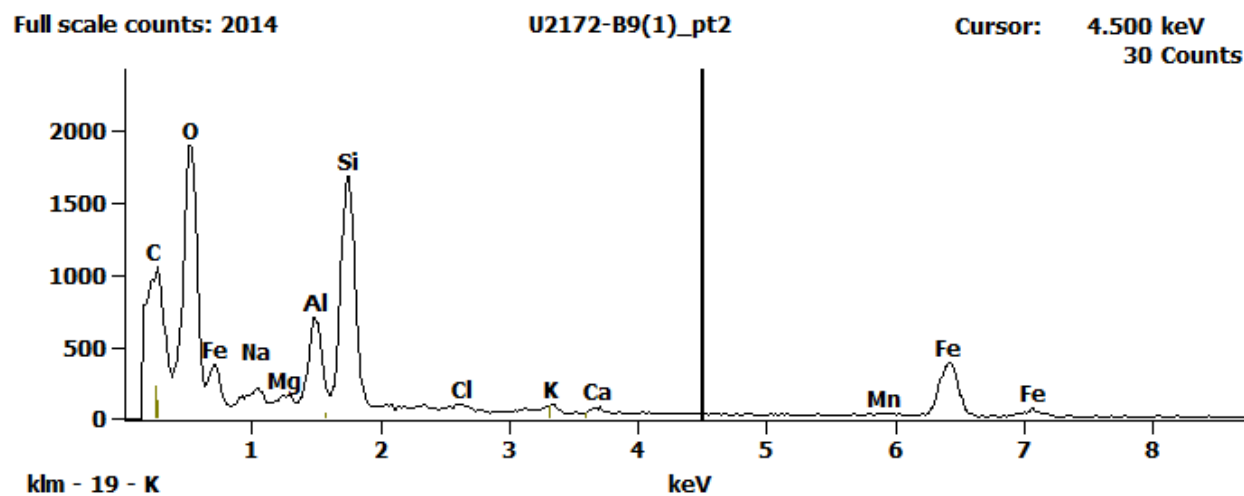


Figure 2. EDS spectra for sample U2172-B9 taken at test area 2. The test area is labeled in the particle SEM photo.

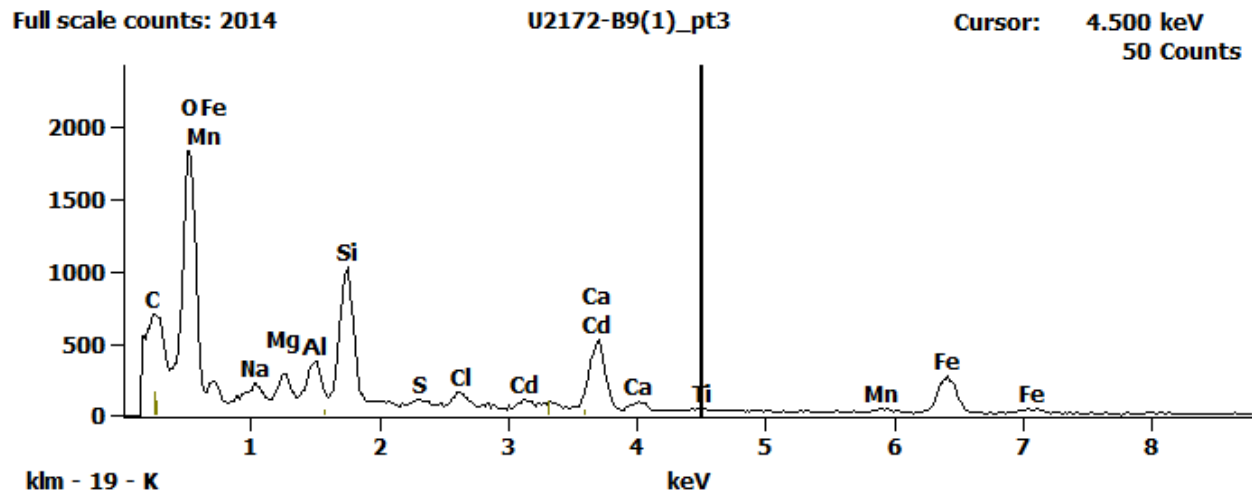


Figure 3. EDS spectra for sample U2172-B9 taken at test area 3. The test area is labeled in the particle SEM photo.

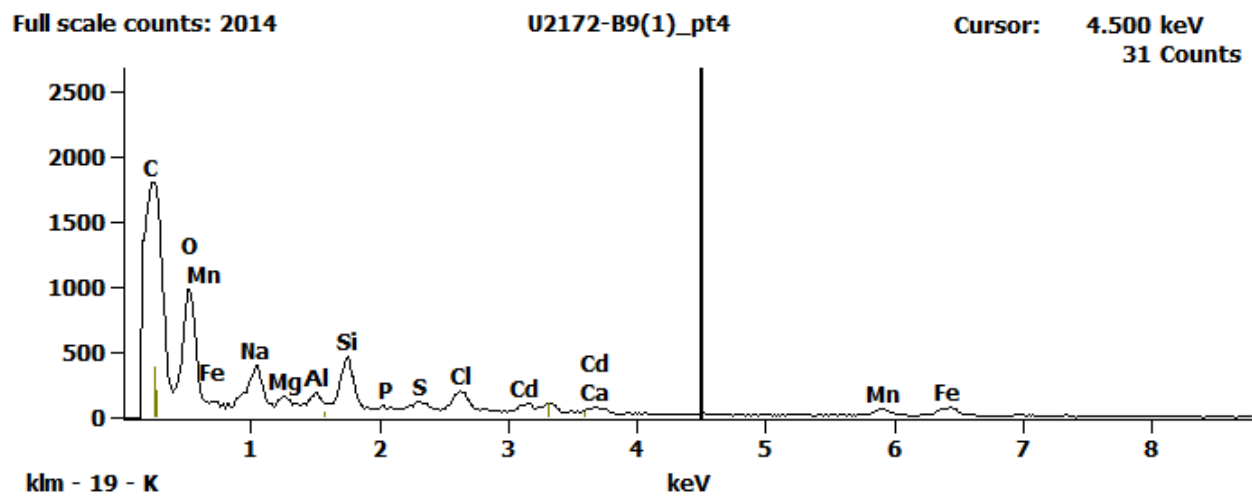
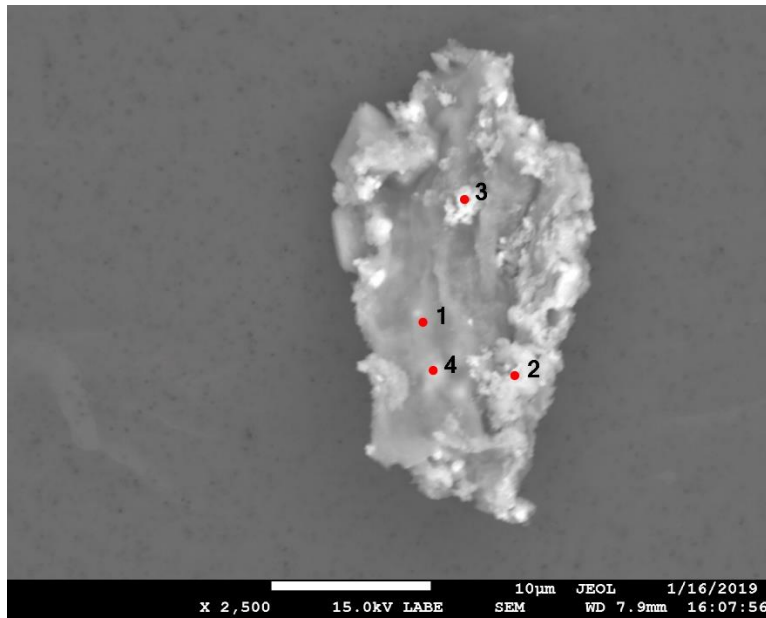


Figure 4. EDS spectra for sample U2172-B9 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 B10



Particle Size:	15x30 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2172 Cluster 5
Comments:	

SEM photo of sample U2172-B10 with labeled EDS testing locations.

Cluster of Origin: U2172 Cluster 5

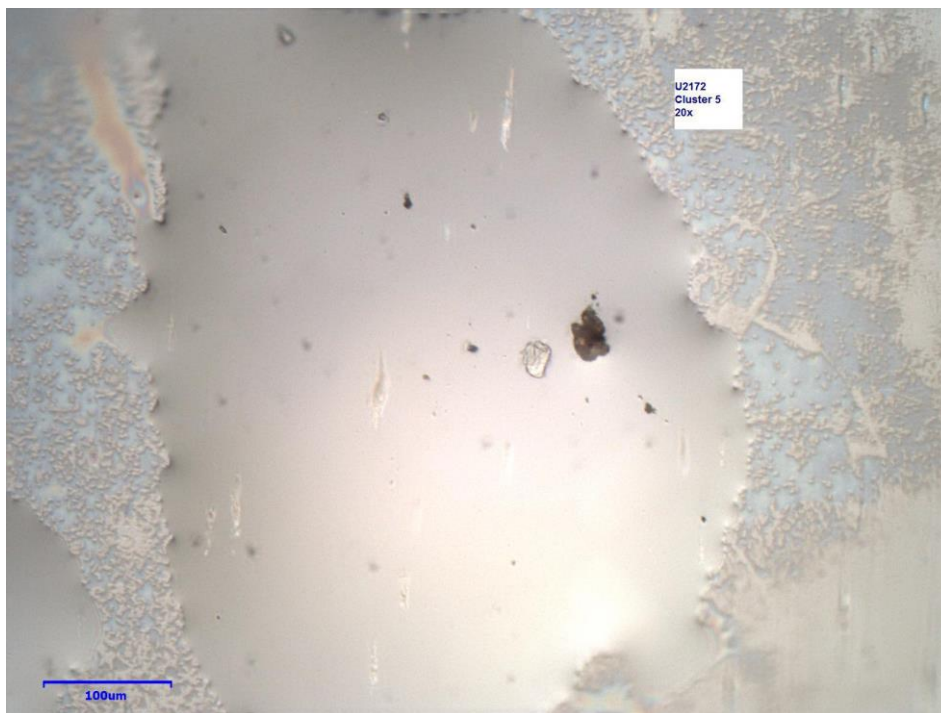


Photo of cluster U2172 Cluster 5.

U2172 B10 - EDS Spectra

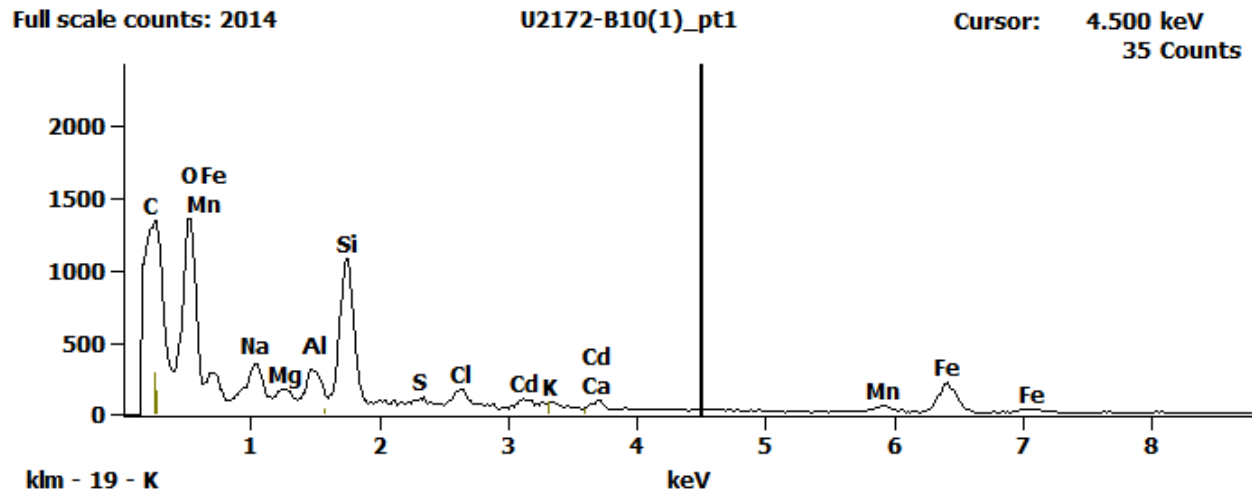


Figure 1. EDS spectra for sample U2172-B10 taken at test area 1. The test area is labeled in the particle SEM photo.

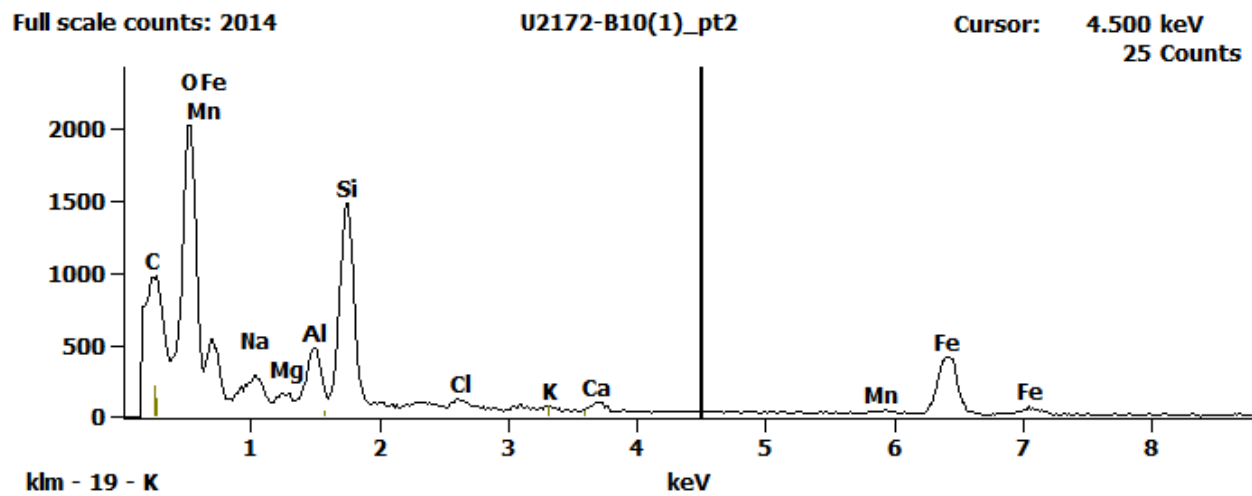


Figure 2. EDS spectra for sample U2172-B10 taken at test area 2. The test area is labeled in the particle SEM photo.

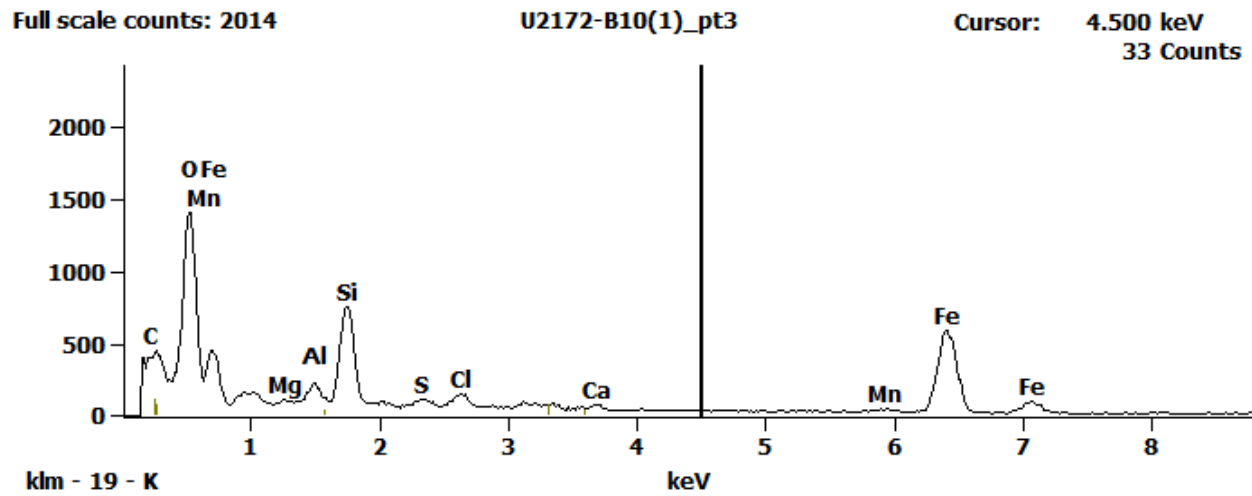


Figure 3. EDS spectra for sample U2172-B10 taken at test area 3. The test area is labeled in the particle SEM photo.

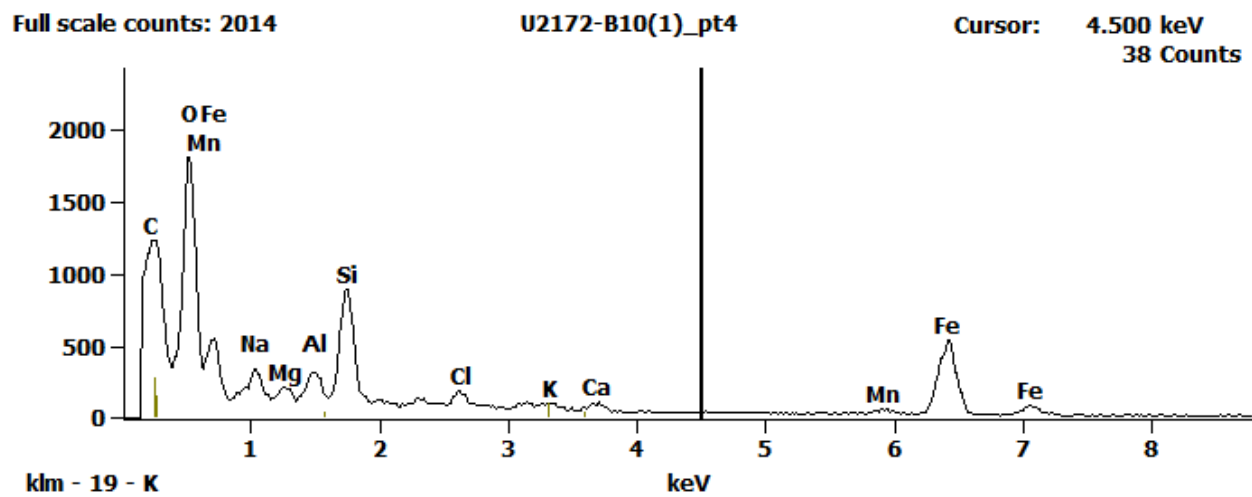
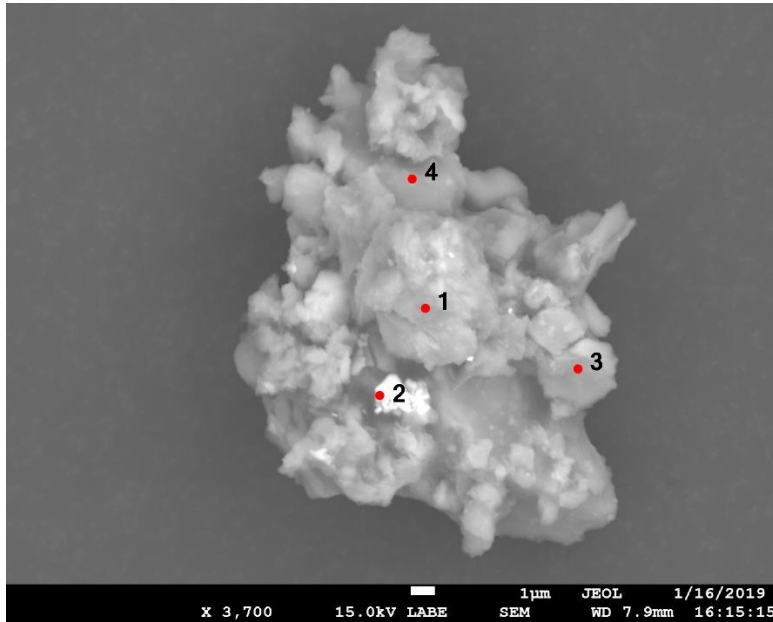


Figure 4. EDS spectra for sample U2172-B10 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 B11



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

SEM photo of sample U2172-B11 with labeled EDS testing locations.

U2172 B11 - EDS Spectra

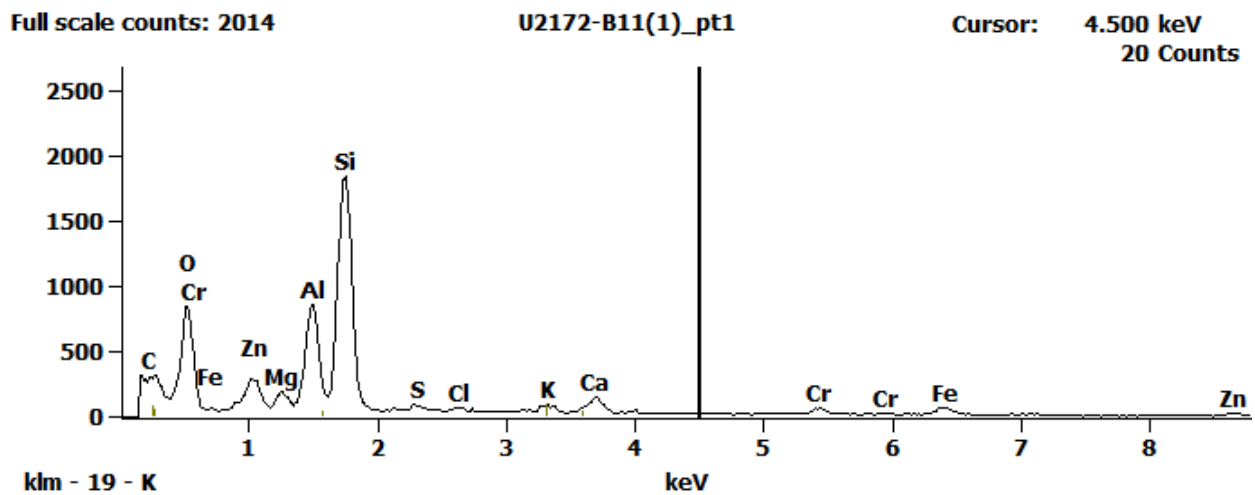


Figure 1. EDS spectra for sample U2172-B11 taken at test area 1. The test area is labeled in the particle SEM photo.

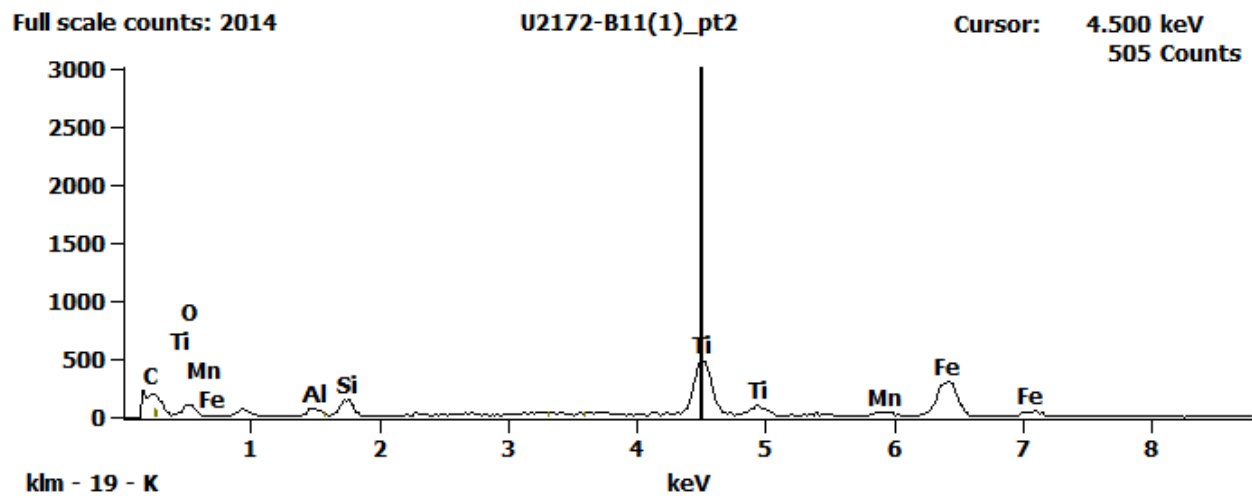


Figure 2. EDS spectra for sample U2172-B11 taken at test area 2. The test area is labeled in the particle SEM photo.

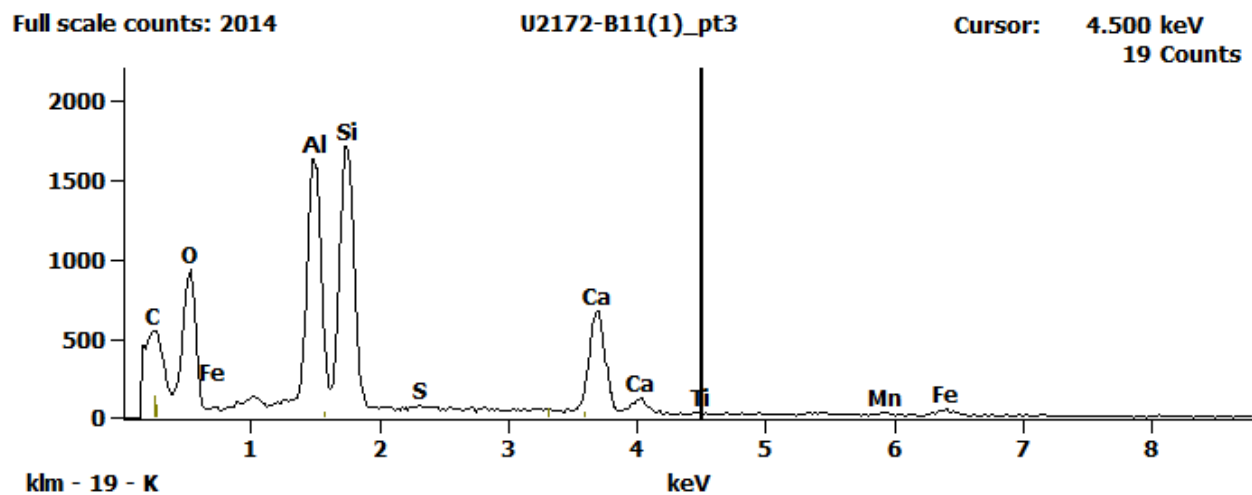


Figure 3. EDS spectra for sample U2172-B11 taken at test area 3. The test area is labeled in the particle SEM photo.

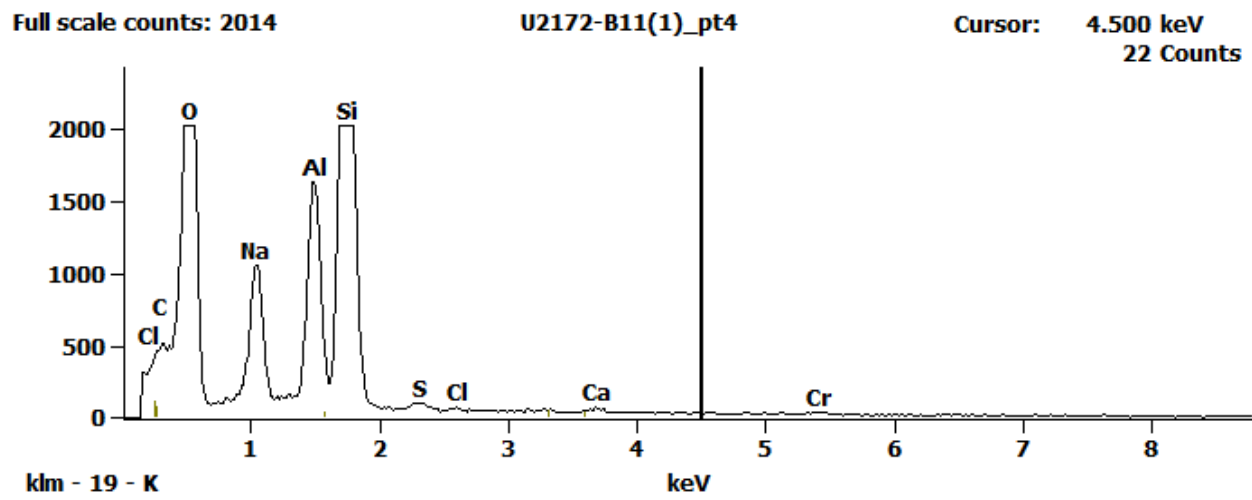
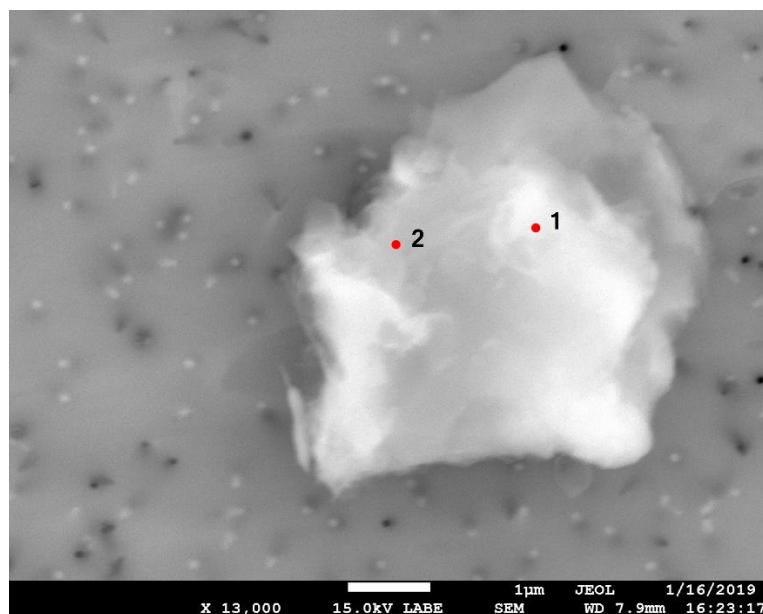


Figure 4. EDS spectra for sample U2172-B11 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 B12



Particle Size:	5 μm
Shape:	Equidimensional
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-B12 with labeled EDS testing locations.

U2172 B12 - EDS Spectra

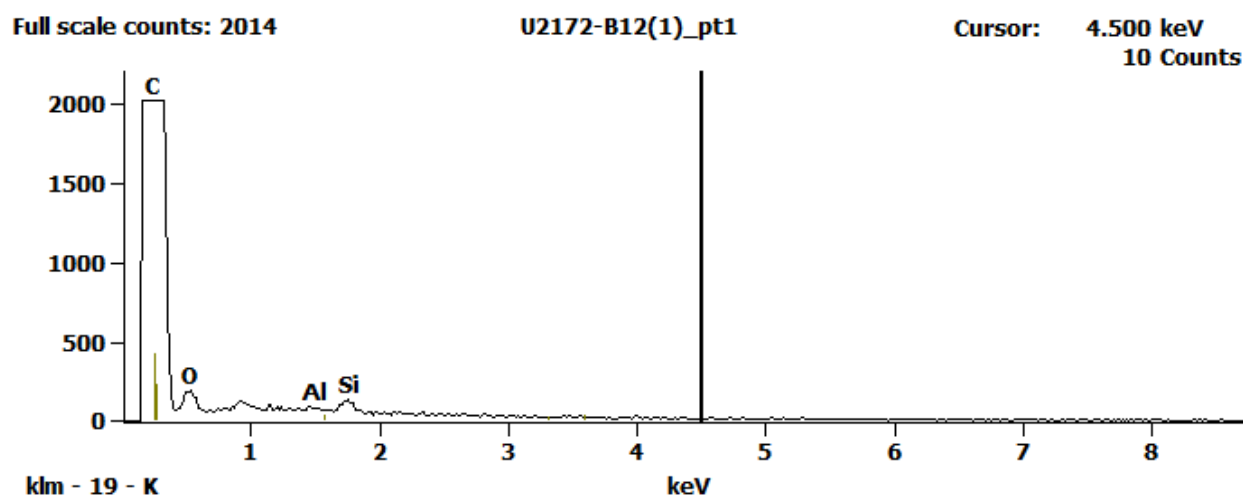


Figure 1. EDS spectra for sample U2172-B12 taken at test area 1. The test area is labeled in the particle SEM photo.

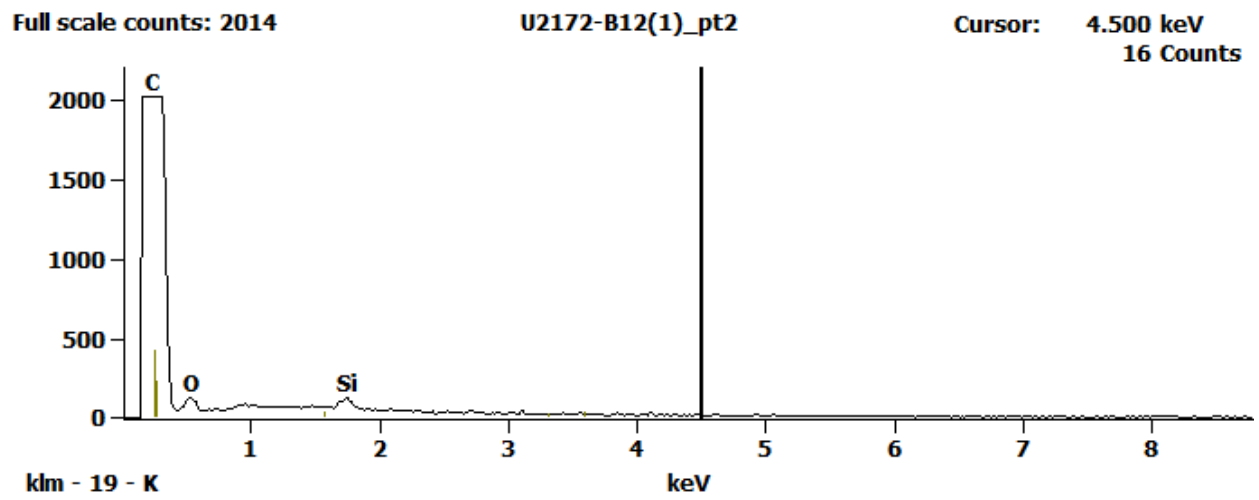
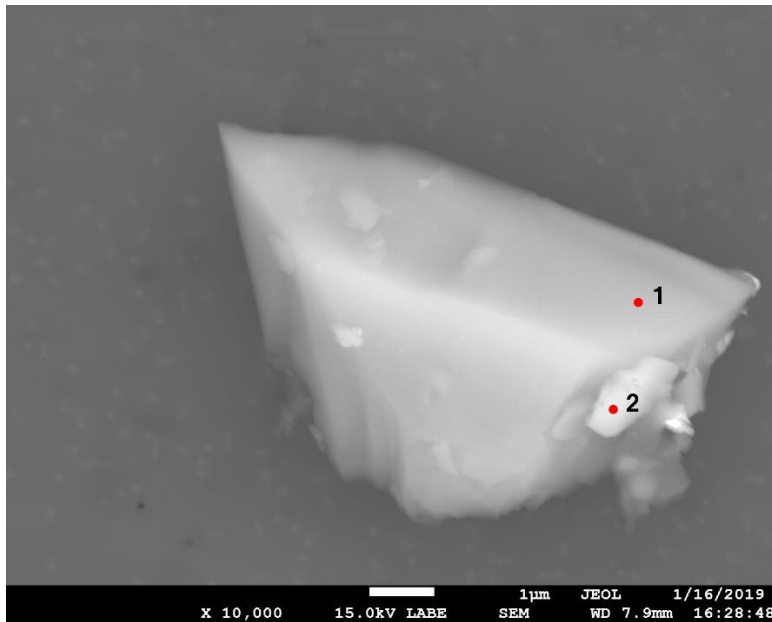


Figure 2. EDS spectra for sample U2172-B12 taken at test area 2. The test area is labeled in the particle SEM photo..

U2172 B13



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

SEM photo of sample U2172-B13 with labeled EDS testing locations.

U2172 B13 - EDS Spectra

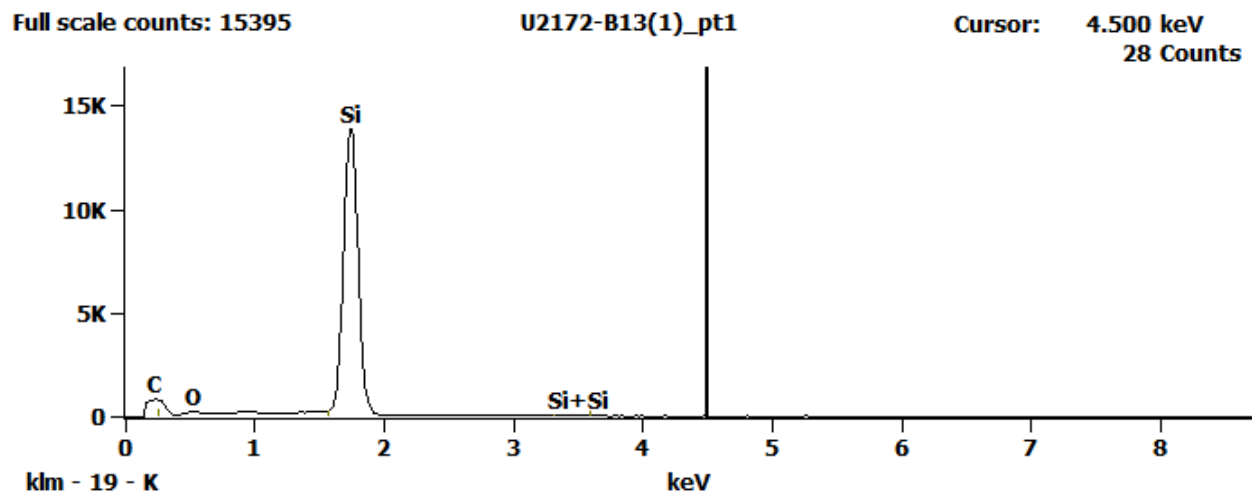


Figure 1. EDS spectra for sample U2172-B13 taken at test area 1. The test area is labeled in the particle SEM photo.

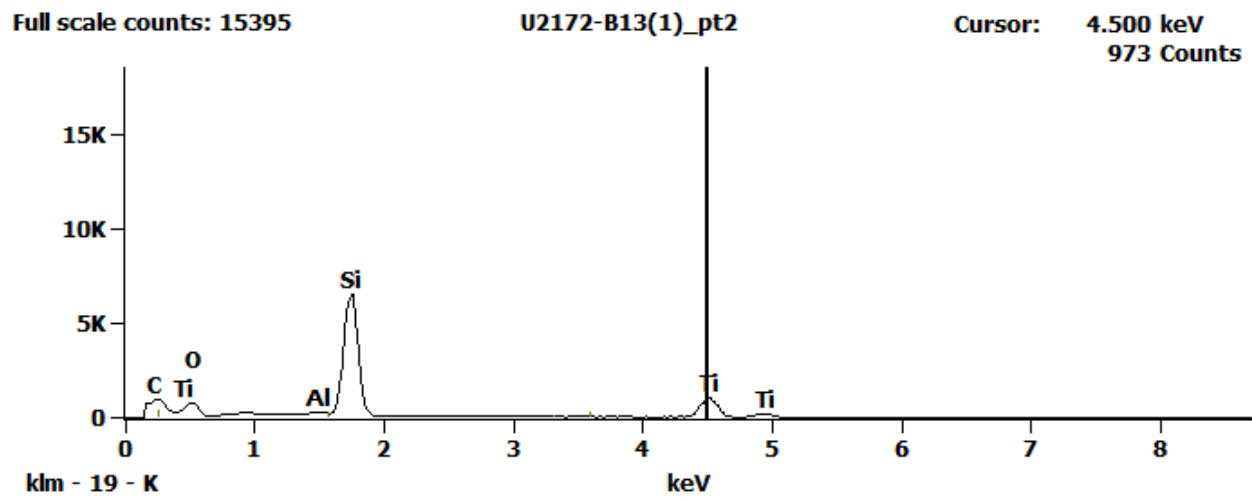
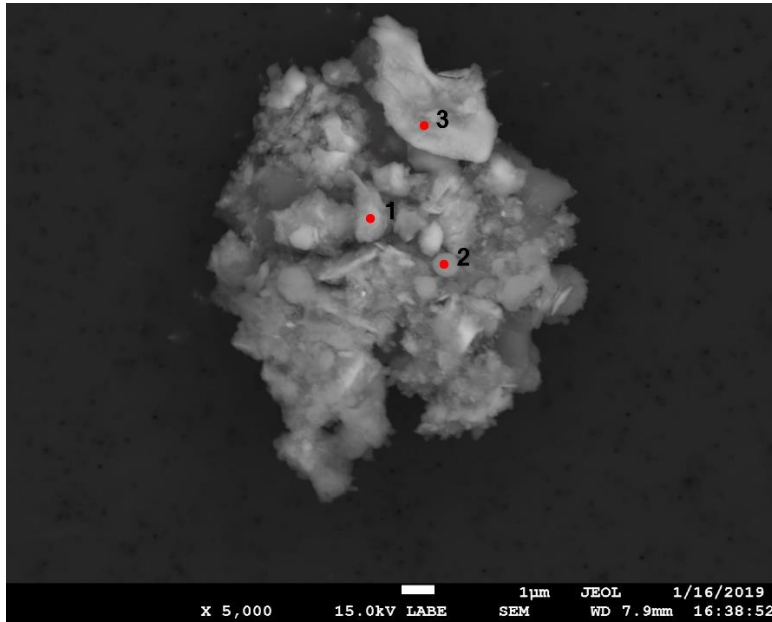


Figure 2. EDS spectra for sample U2172-B13 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B14



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

SEM photo of sample U2172-B14 with labeled EDS testing locations.

U2172 B14 - EDS Spectra

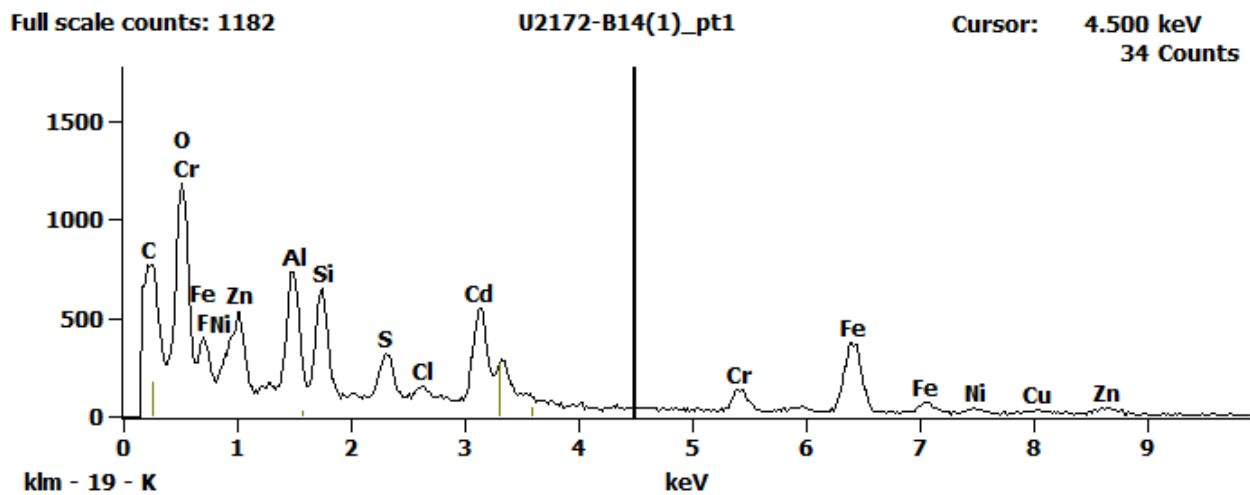


Figure 1. EDS spectra for sample U2172-B14 taken at test area 1. The test area is labeled in the particle SEM photo.

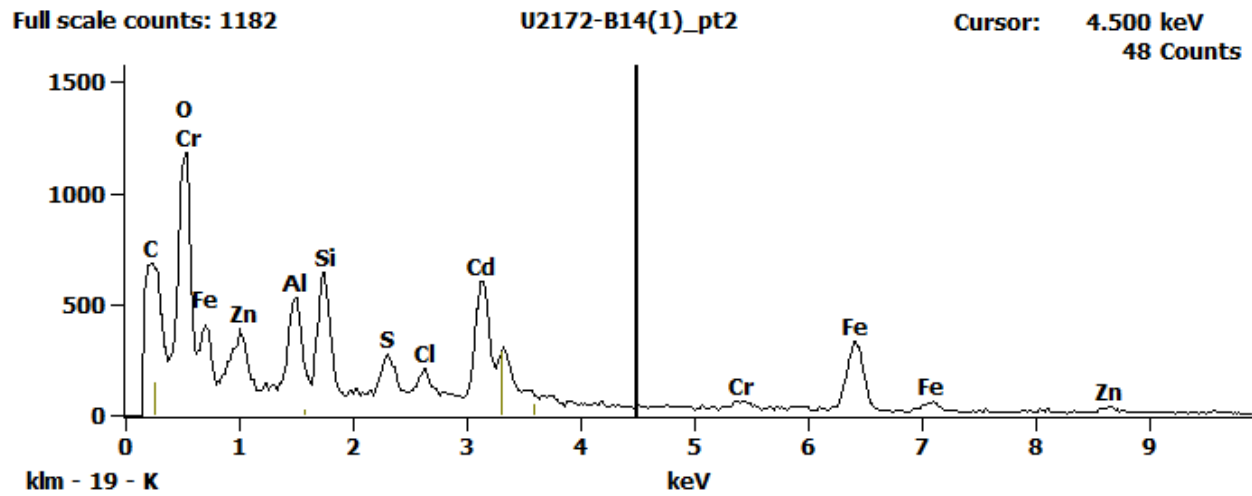


Figure 2. EDS spectra for sample U2172-B14 taken at test area 2. The test area is labeled in the particle SEM photo.

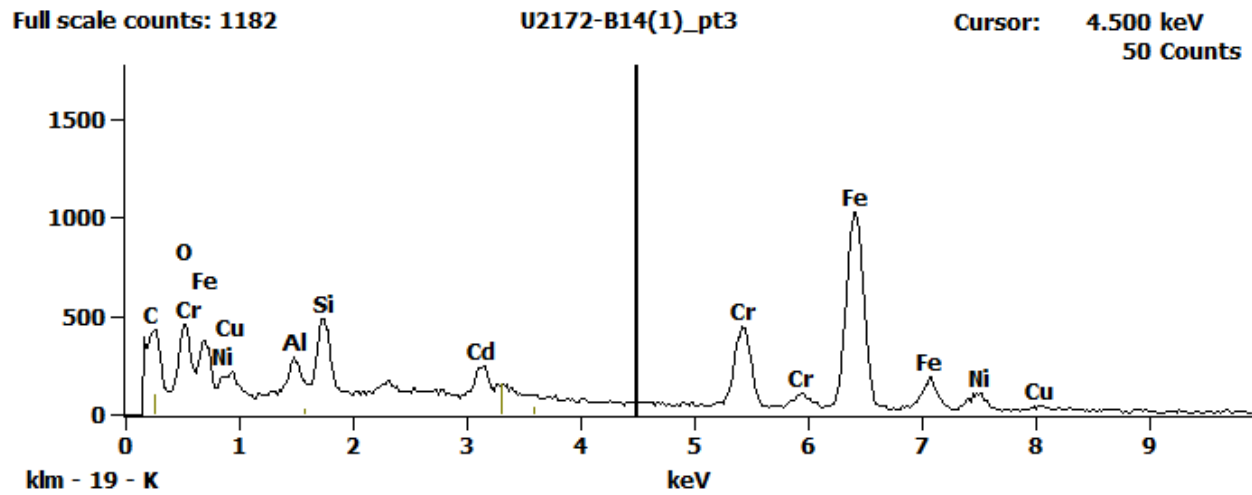
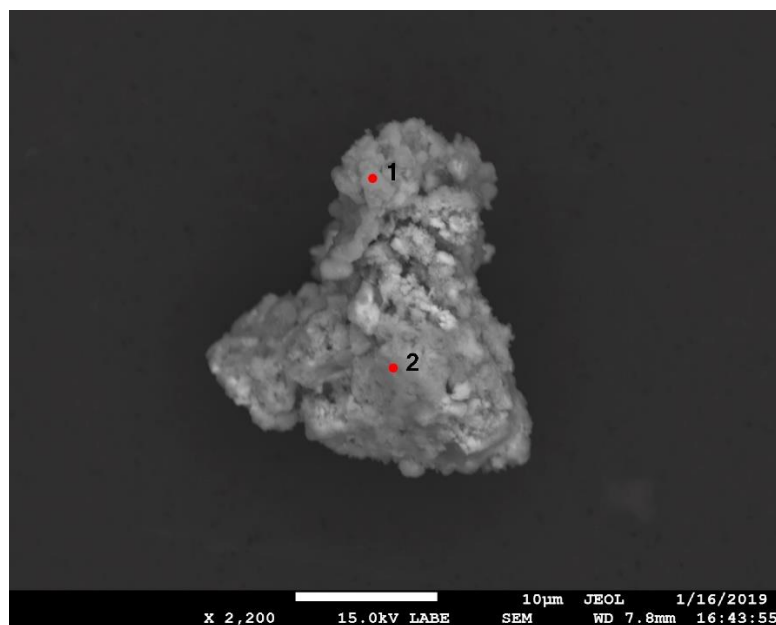


Figure 3. EDS spectra for sample U2172-B14 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 B15



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

SEM photo of sample U2172-B15 with labeled EDS testing locations.

U2172 B15 - EDS Spectra

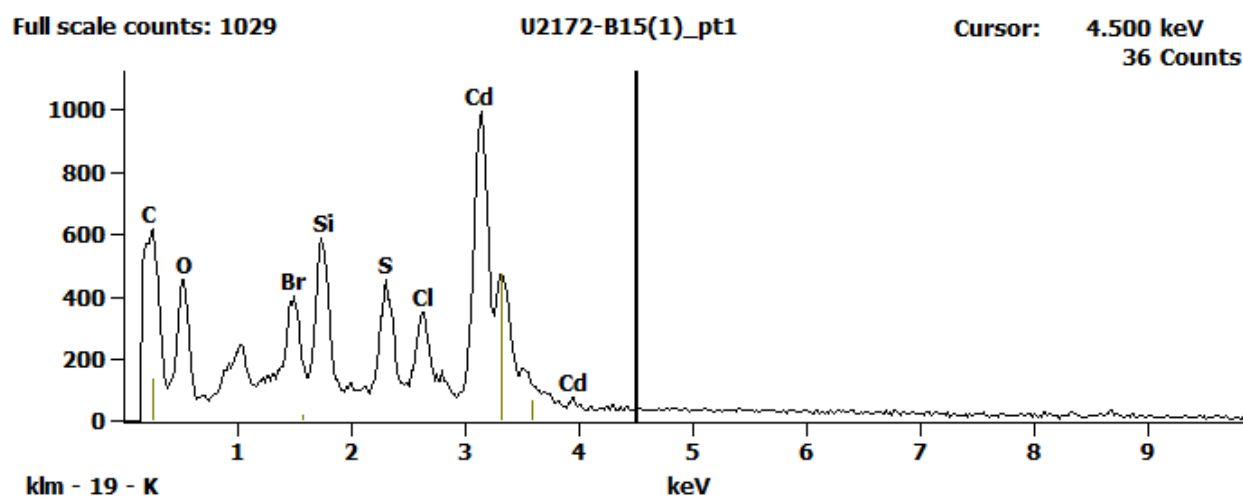


Figure 1. EDS spectra for sample U2172-B15 taken at test area 1. The test area is labeled in the particle SEM photo.

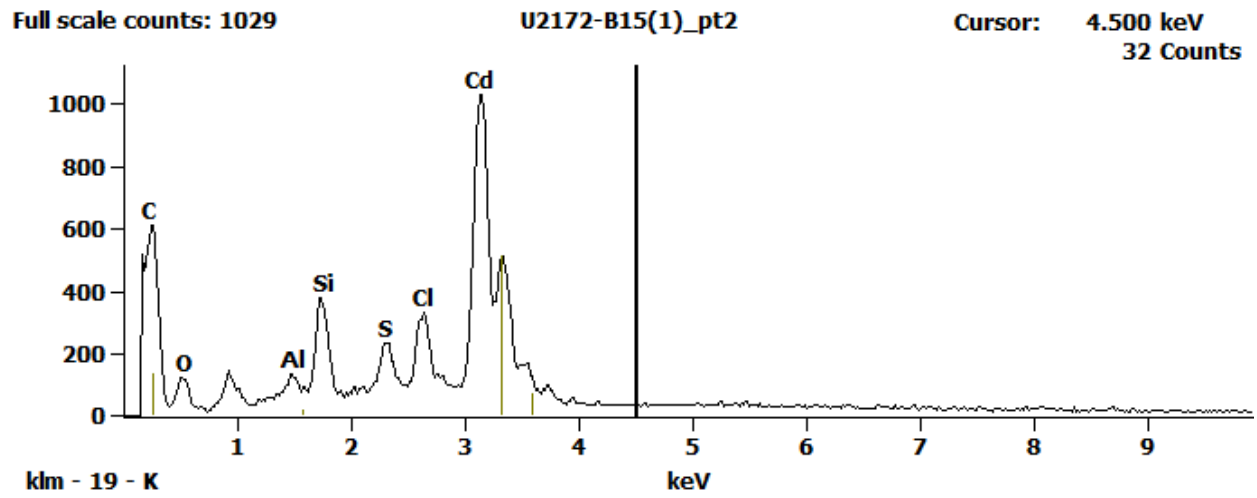
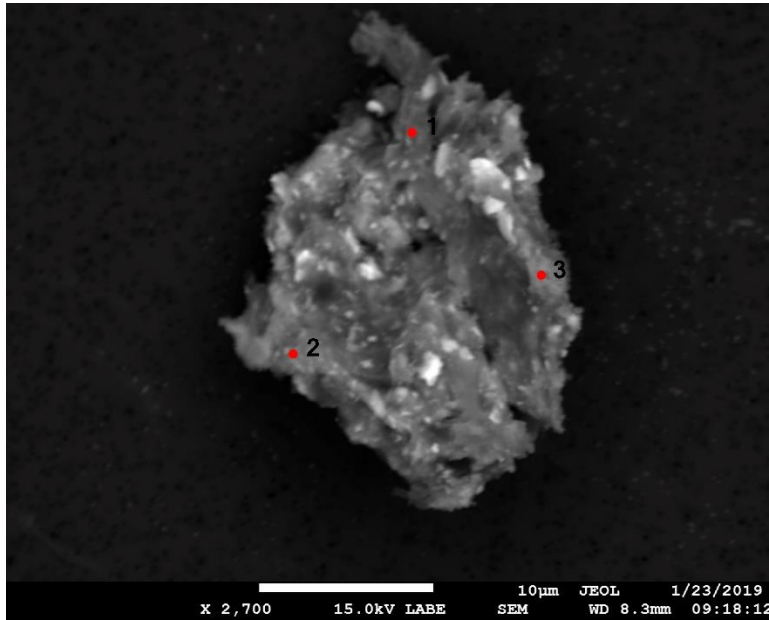


Figure 2. EDS spectra for sample U2172-B15 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 C3



Particle Size:	21 μm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-C3 with labeled EDS testing locations.

U2172 C3 - EDS Spectra

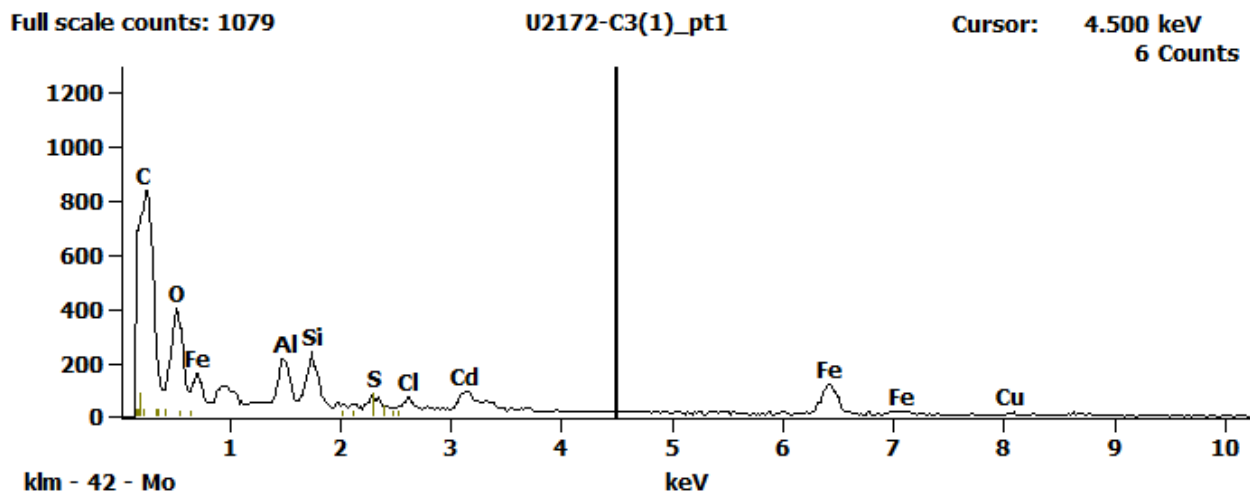


Figure 1. EDS spectra for sample U2172-C3 taken at test area 1. The test area is labeled in the particle SEM photo.

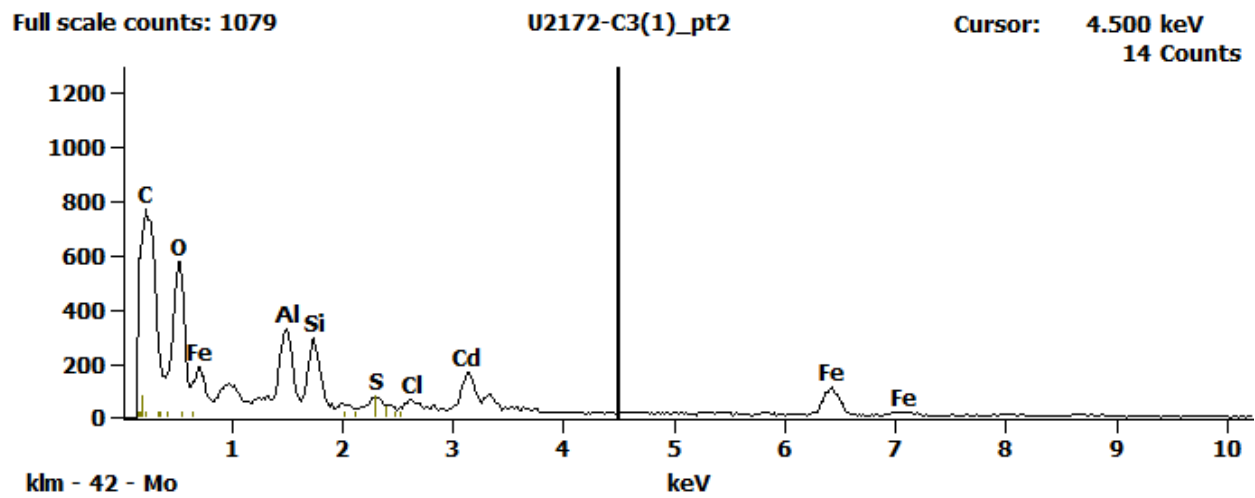


Figure 2. EDS spectra for sample U2172-C3 taken at test area 2. The test area is labeled in the particle SEM photo.

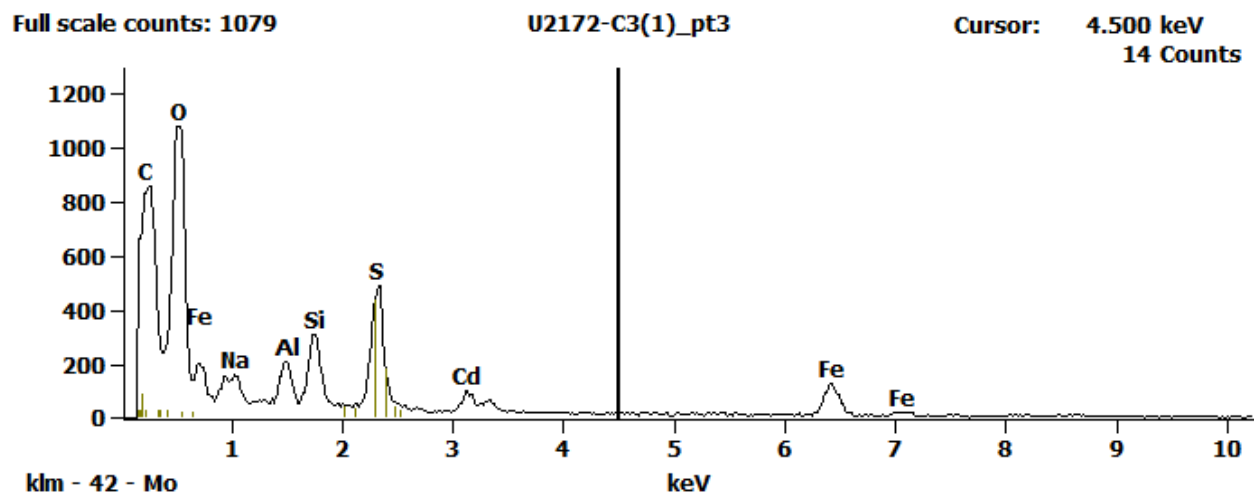
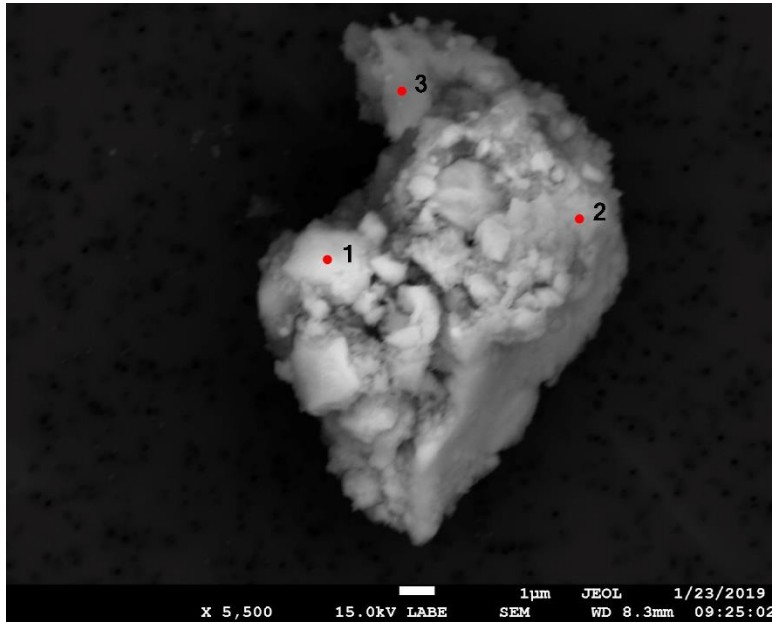


Figure 3. EDS spectra for sample U2172-C3 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C4



Particle Size:	15x7 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, BROWN
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-C4 with labeled EDS testing locations.

U2172 C4 - EDS Spectra

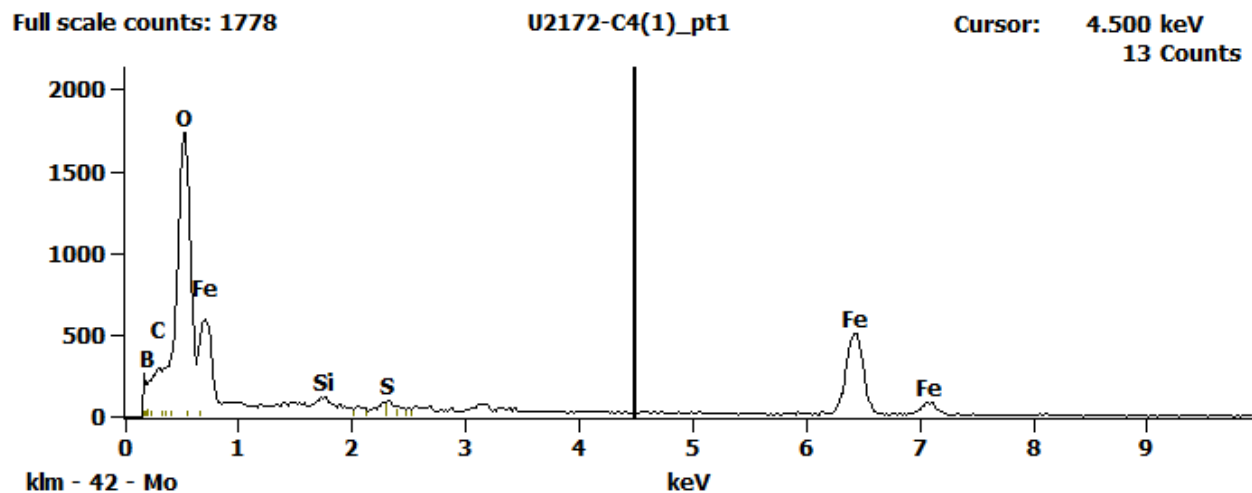


Figure 1. EDS spectra for sample U2172-C4 taken at test area 1. The test area is labeled in the particle SEM photo.

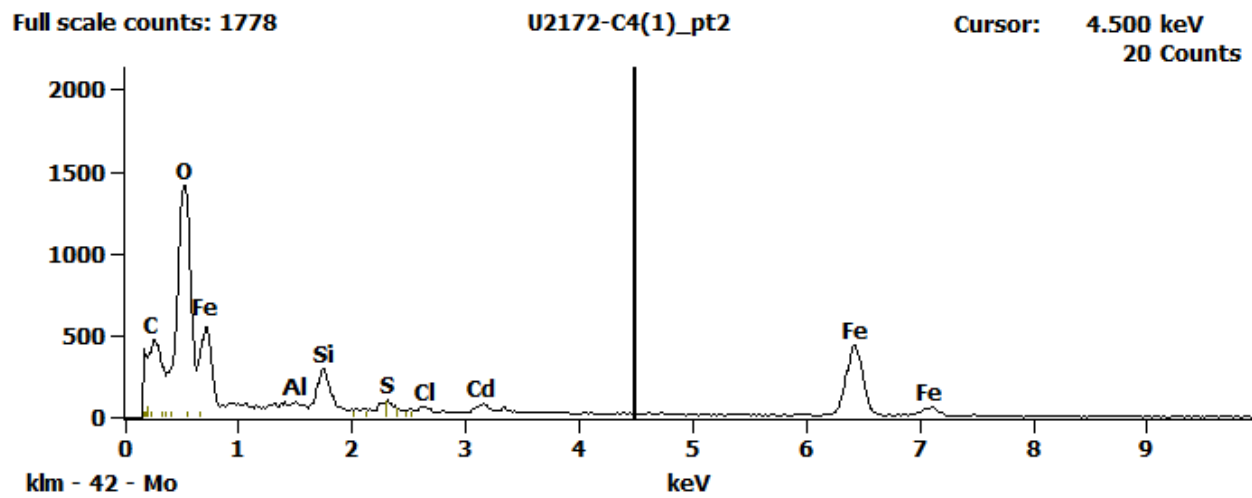


Figure 2. EDS spectra for sample U2172-C4 taken at test area 2. The test area is labeled in the particle SEM photo.

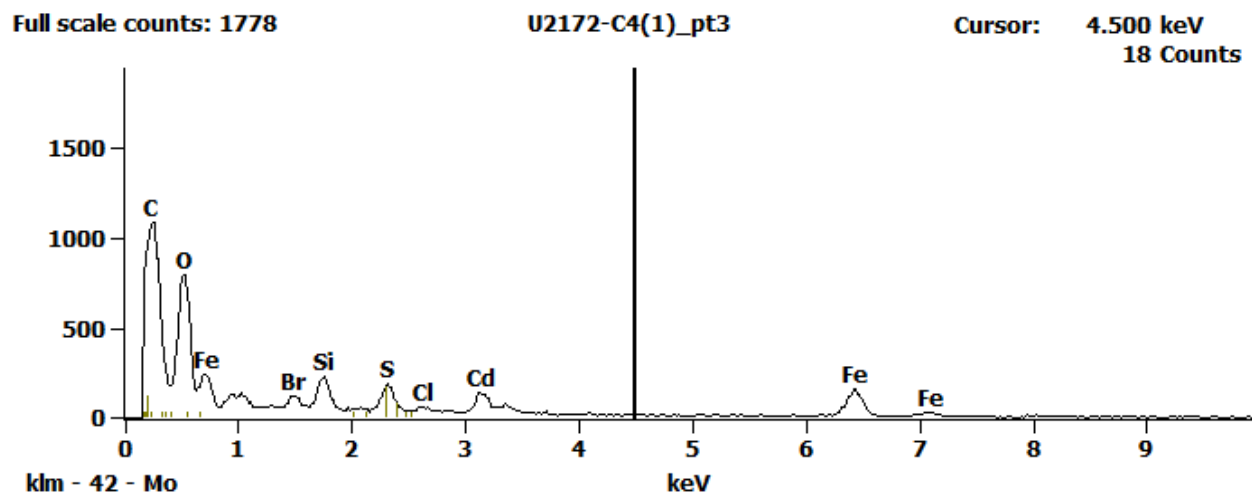
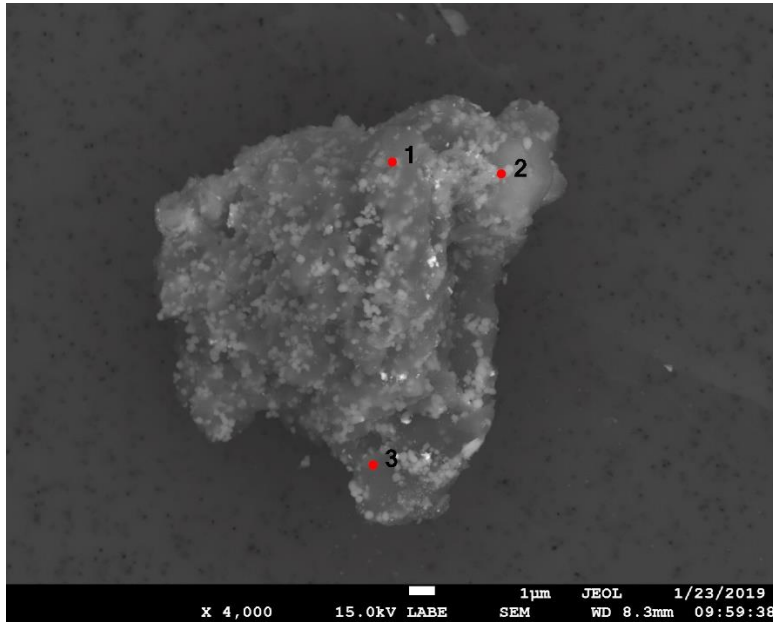


Figure 3. EDS spectra for sample U2172-C4 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C7



SEM photo of sample U2172-C7 with labeled EDS testing locations.

Particle Size:	22 µm
Shape:	Equidimensional to Irregular
Transparency:	Translucent to Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

U2172 C7 - EDS Spectra

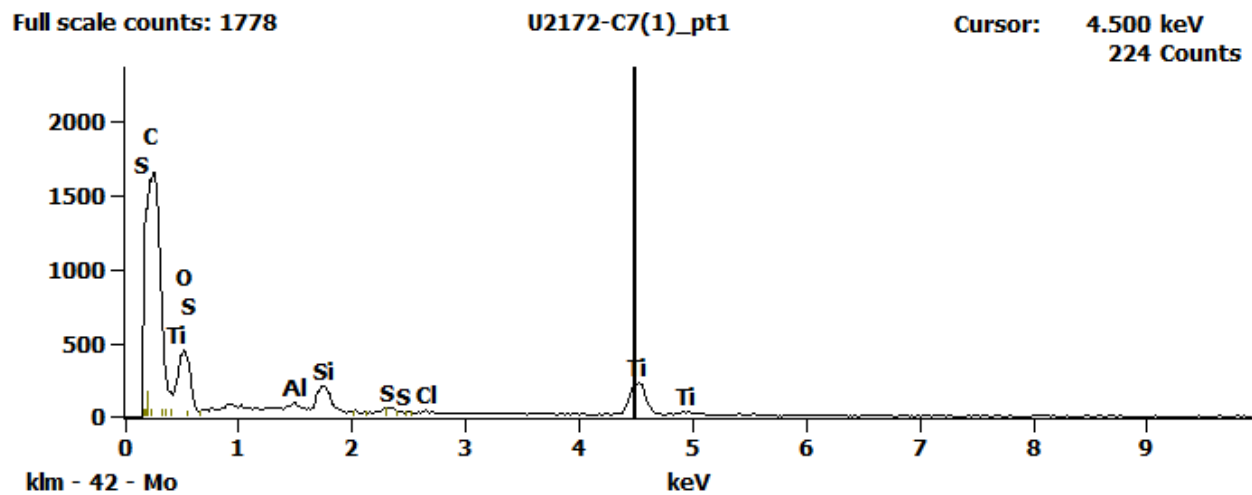


Figure 1. EDS spectra for sample U2172-C7 taken at test area 1. The test area is labeled in the particle SEM photo.

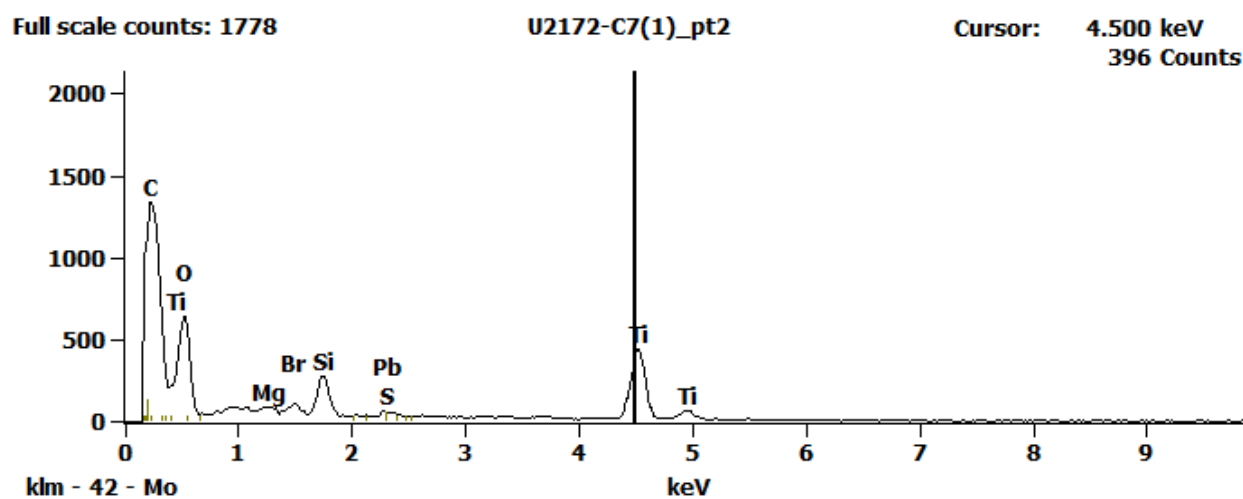


Figure 2. EDS spectra for sample U2172-C7 taken at test area 2. The test area is labeled in the particle SEM photo.

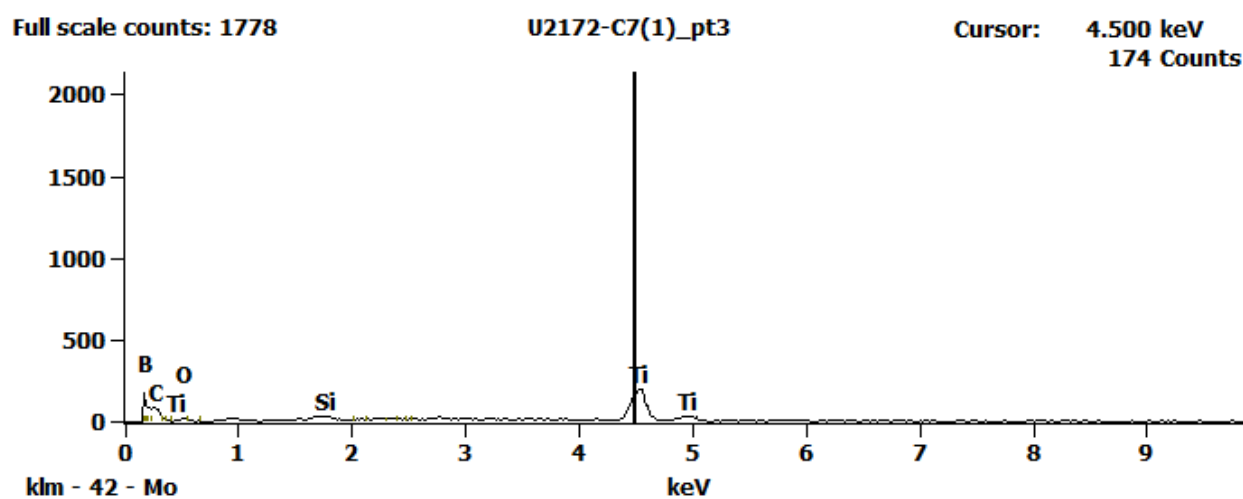
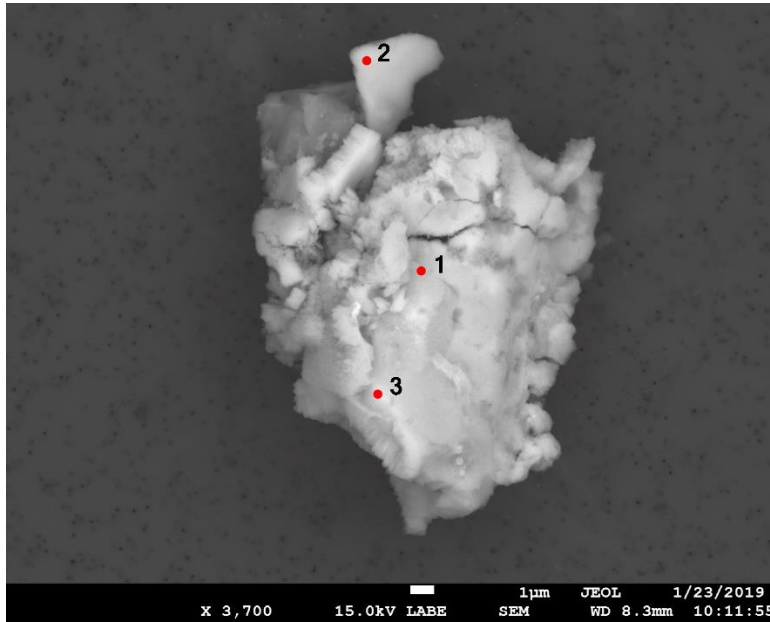


Figure 3. EDS spectra for sample U2172-C7 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C11



SEM photo of sample U2172-C11 with labeled EDS testing locations.

Particle Size:	16 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Resinous to Dull
Particle Type:	POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

U2172 C11 - EDS Spectra

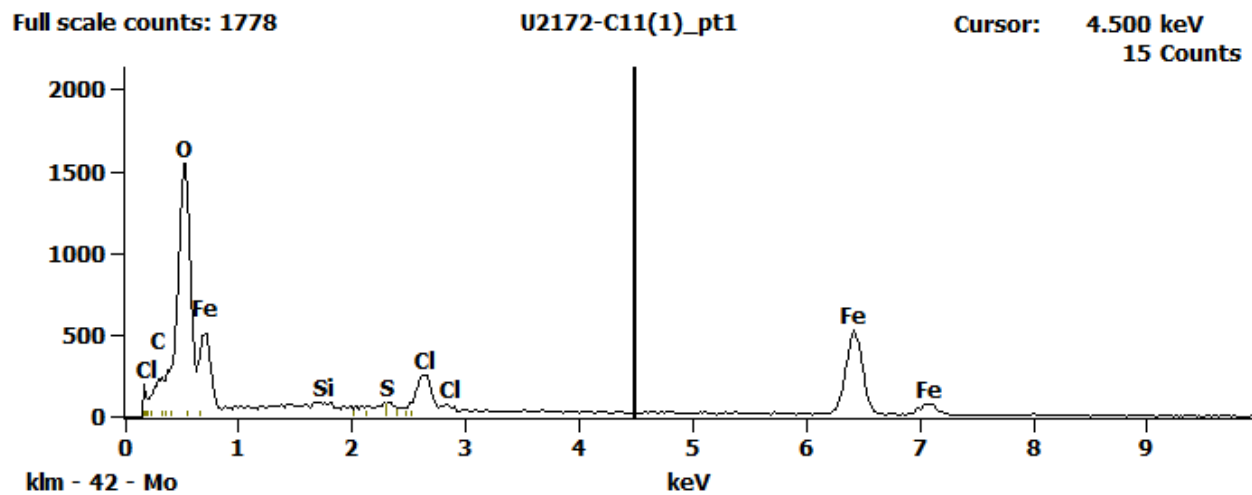


Figure 1. EDS spectra for sample U2172-C11 taken at test area 1. The test area is labeled in the particle SEM photo.

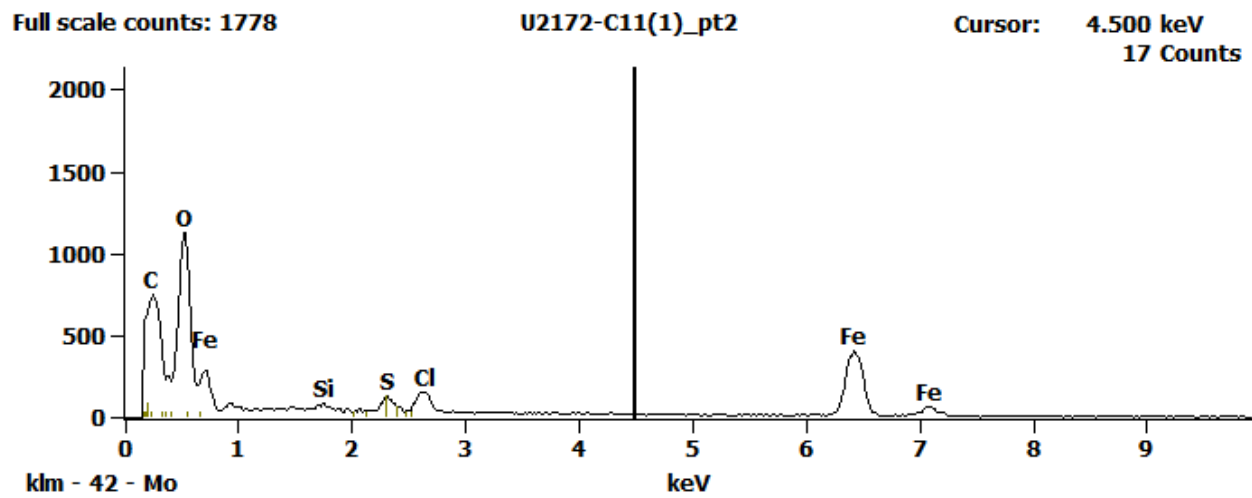


Figure 2. EDS spectra for sample U2172-C11 taken at test area 2. The test area is labeled in the particle SEM photo..

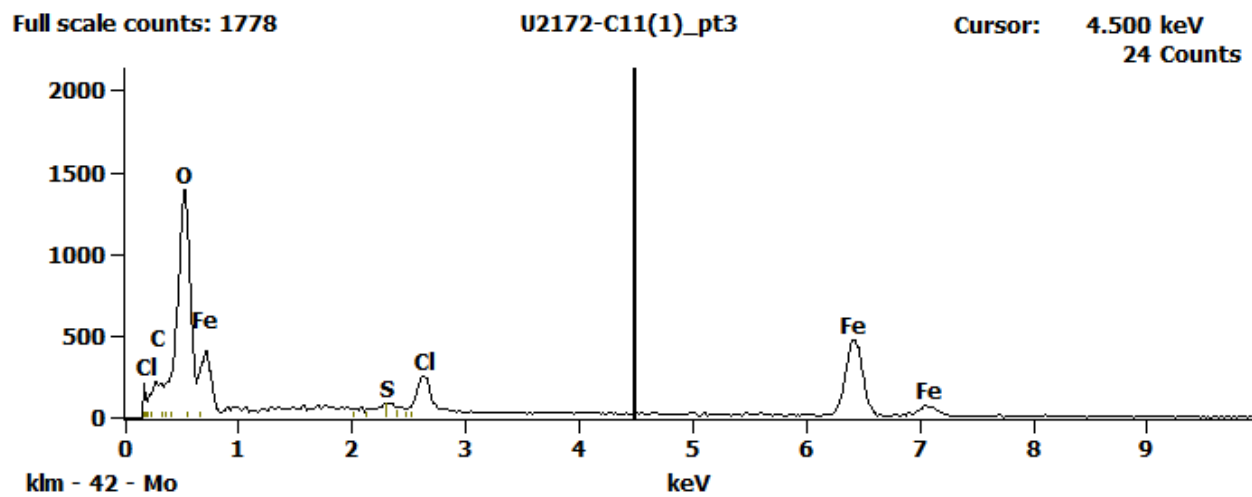
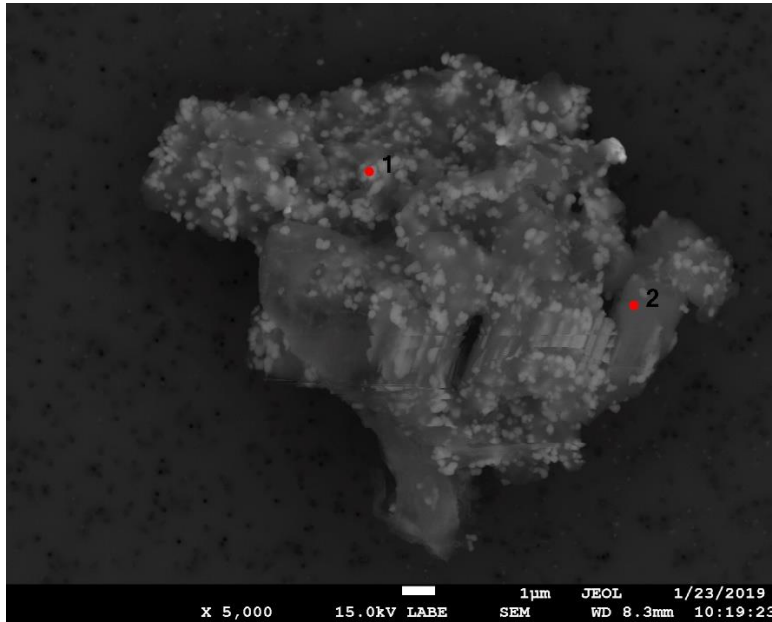


Figure 3. EDS spectra for sample U2172-C11 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C12



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

SEM photo of sample U2172-C12 with labeled EDS testing locations.

U2172 C12 - EDS Spectra

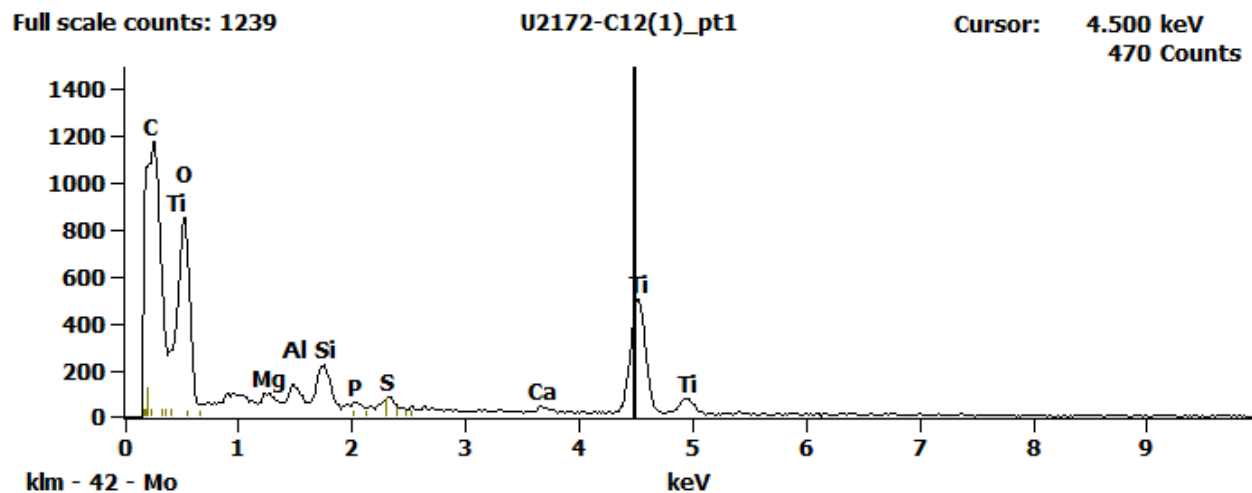


Figure 1. EDS spectra for sample U2172-C12 taken at test area 1. The test area is labeled in the particle SEM photo.

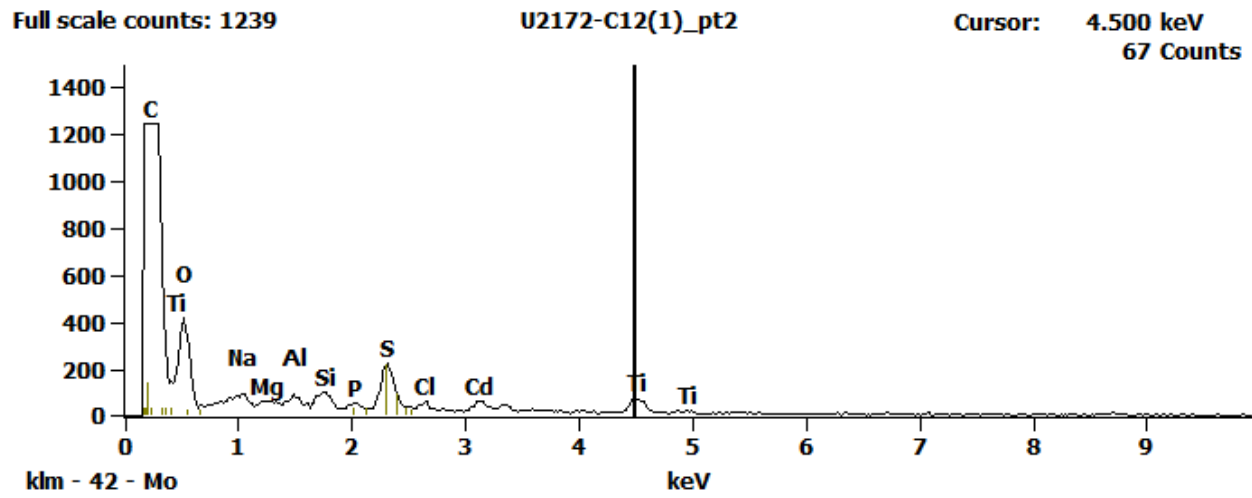
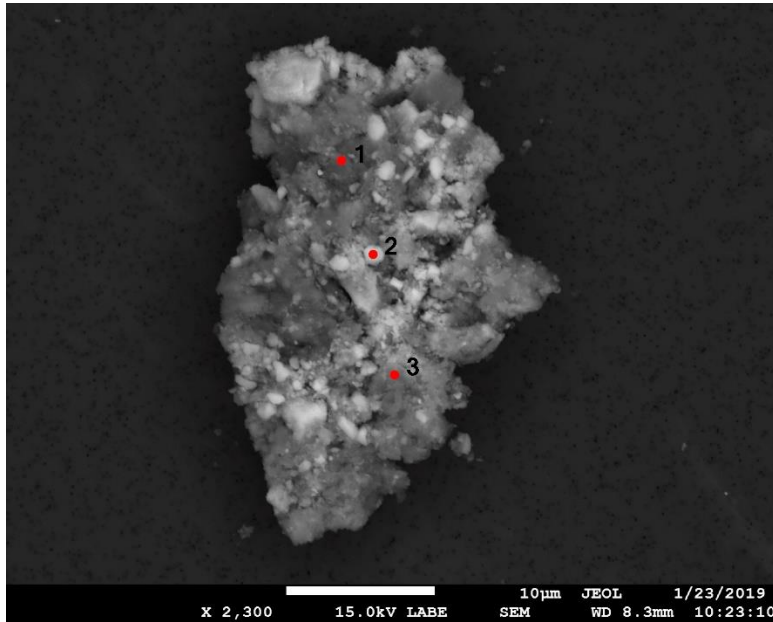


Figure 2. EDS spectra for sample U2172-C12 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 C13



Particle Size:	32 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-C13 with labeled EDS testing locations.

U2172 C13 - EDS Spectra

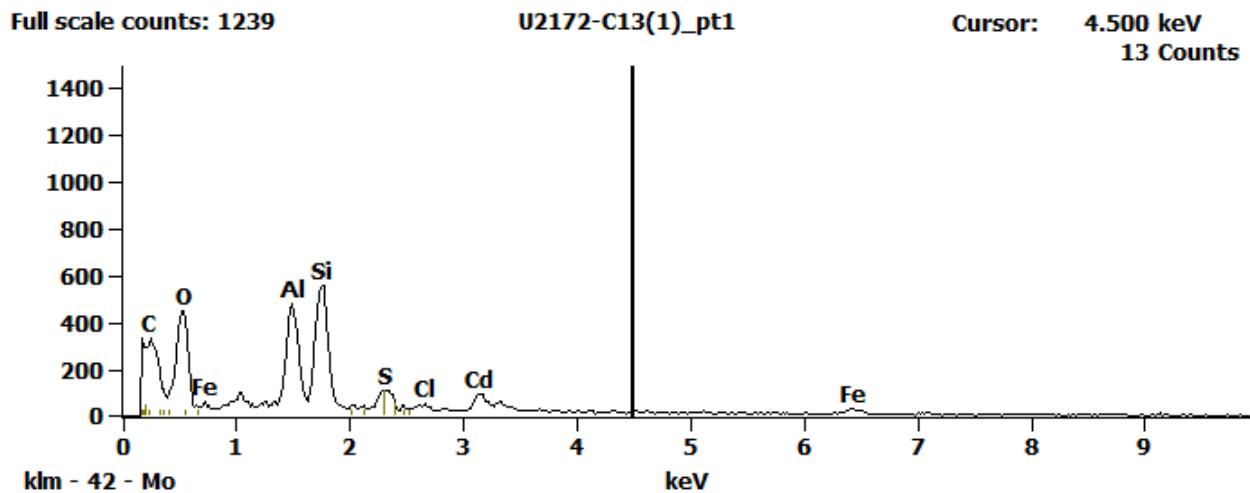


Figure 1. EDS spectra for sample U2172-C13 taken at test area 1. The test area is labeled in the particle SEM photo.

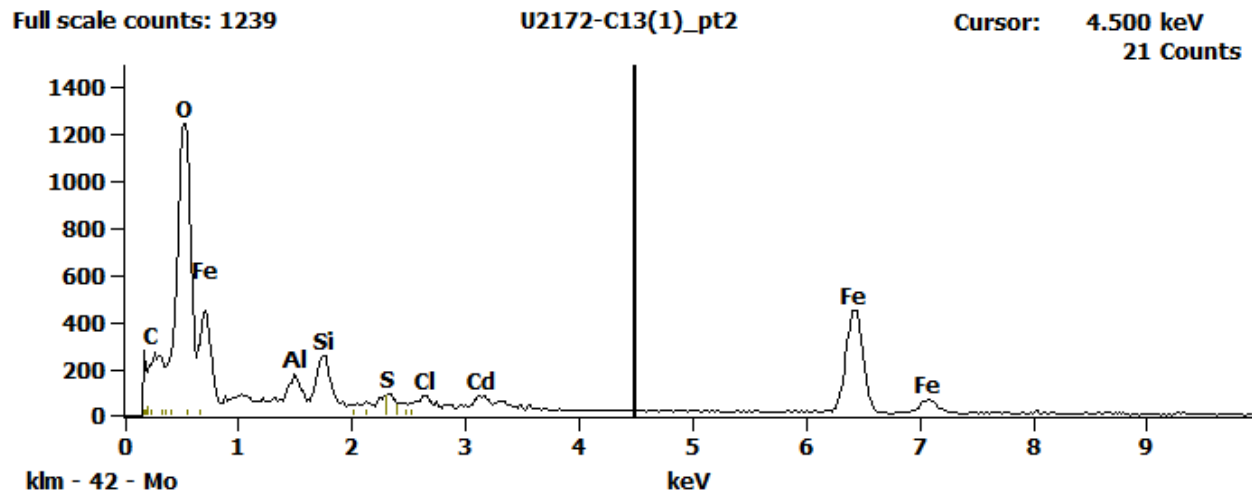


Figure 2. EDS spectra for sample U2172-C13 taken at test area 2. The test area is labeled in the particle SEM photo.

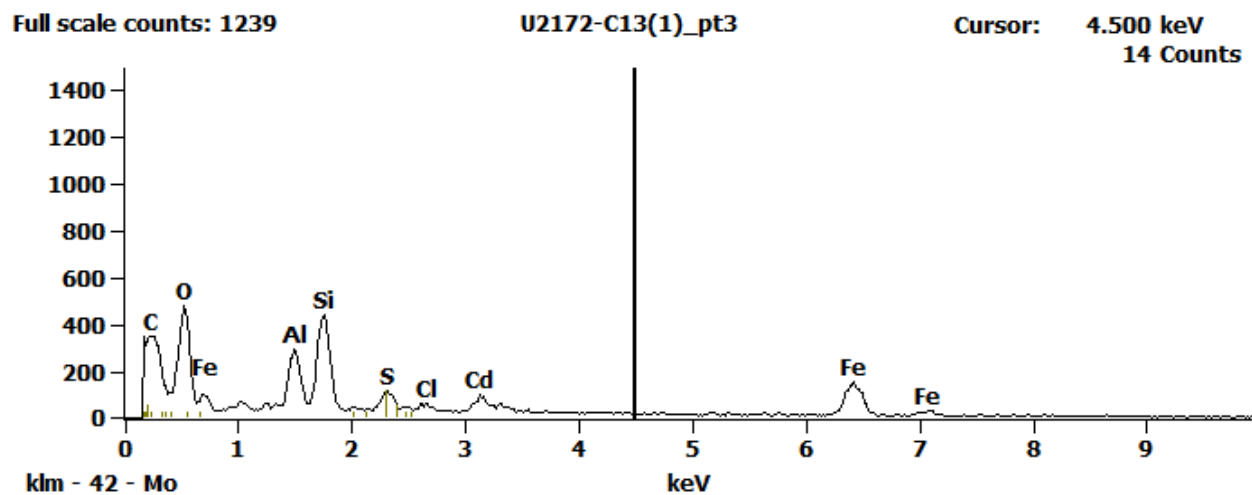
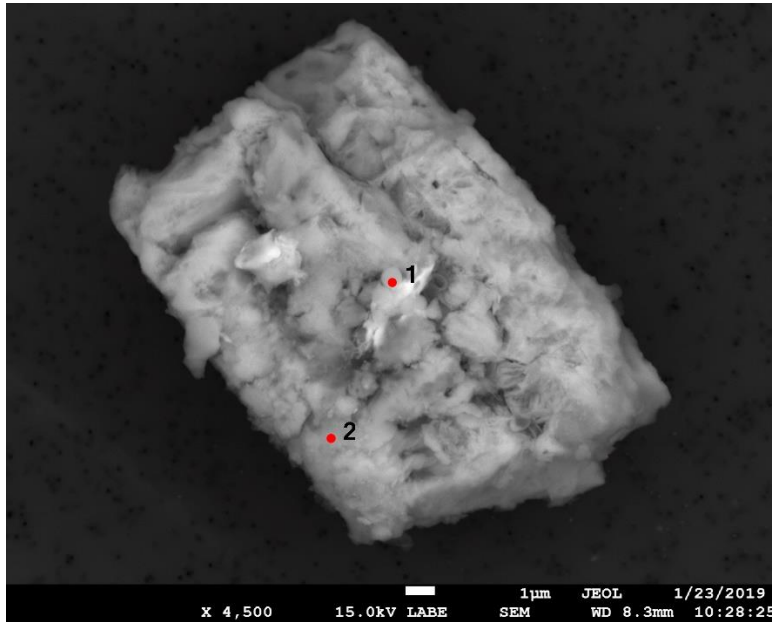


Figure 3. EDS spectra for sample U2172-C13 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 C14



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

SEM photo of sample U2172-C14 with labeled EDS testing locations.

U2172 C14 - EDS Spectra

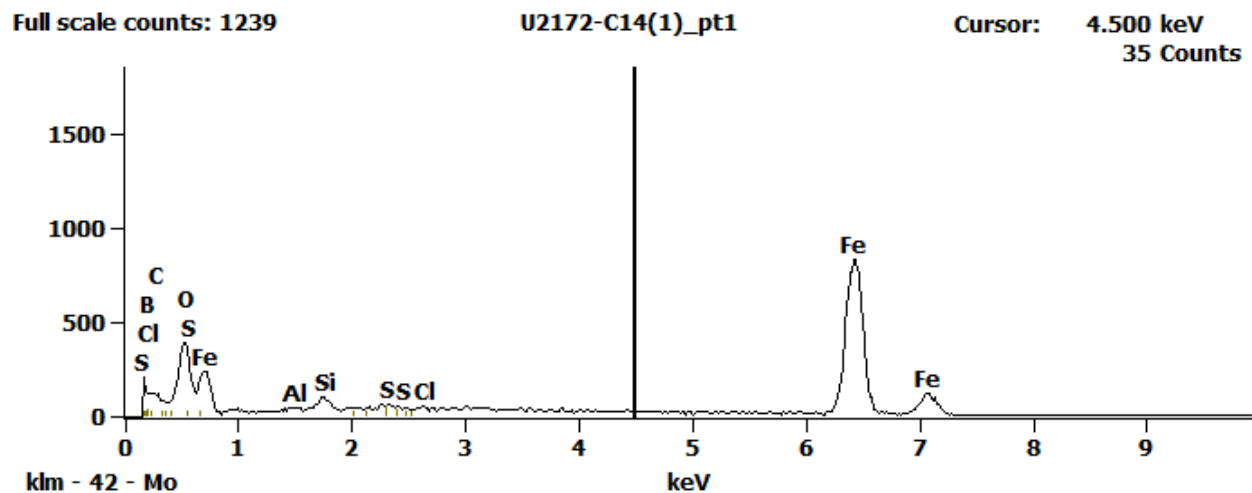


Figure 1. EDS spectra for sample U2172-C14 taken at test area 1. The test area is labeled in the particle SEM photo.

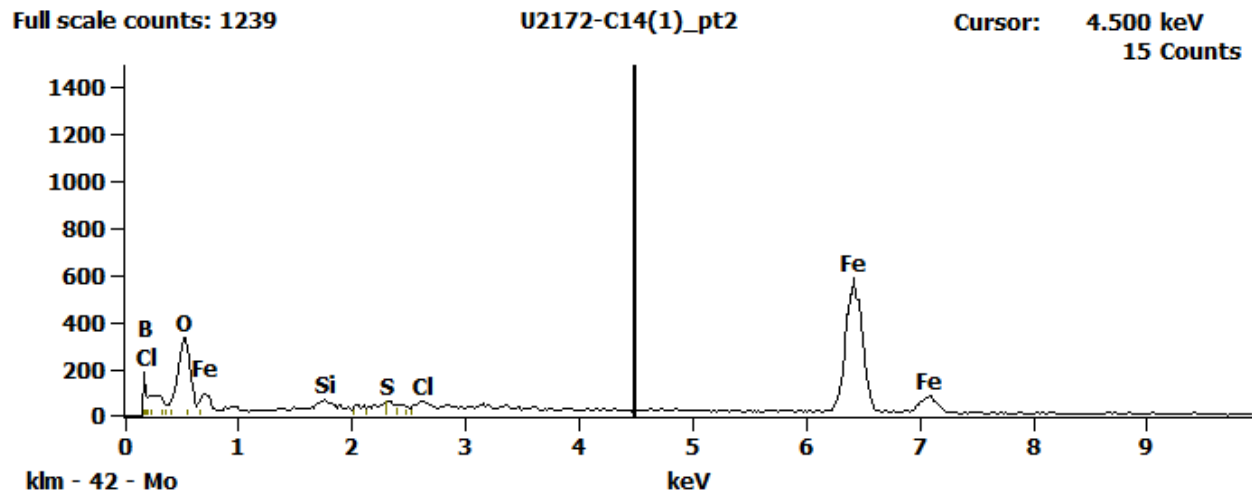
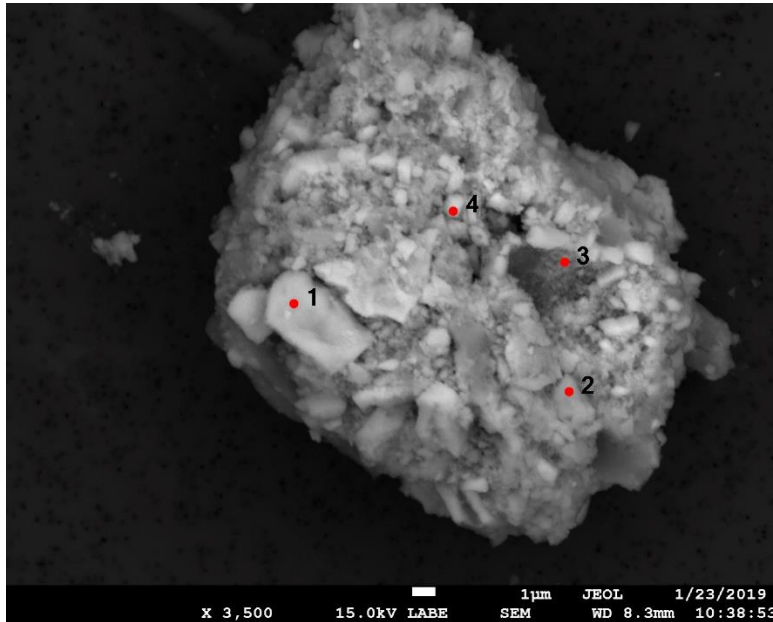


Figure 2. EDS spectra for sample U2172-C14 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 C16



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

SEM Photo of sample U2172 C16 with labeled EDS testing locations.

U2172 C16 - EDS Spectra

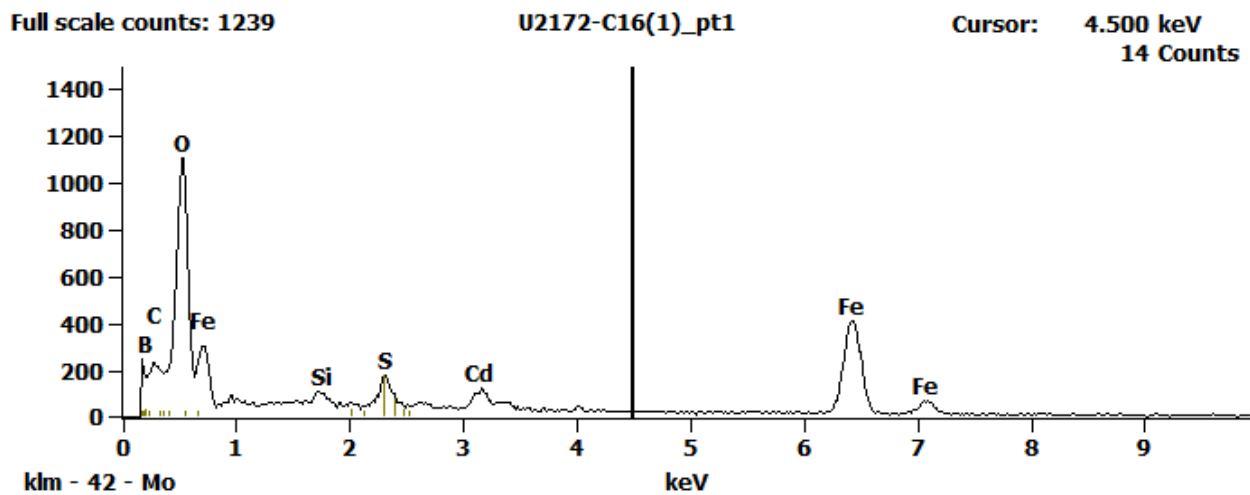


Figure 1. EDS Spectra for sample U2172-C16 taken at test area 1. The test area is labeled in the particle SEM photo.

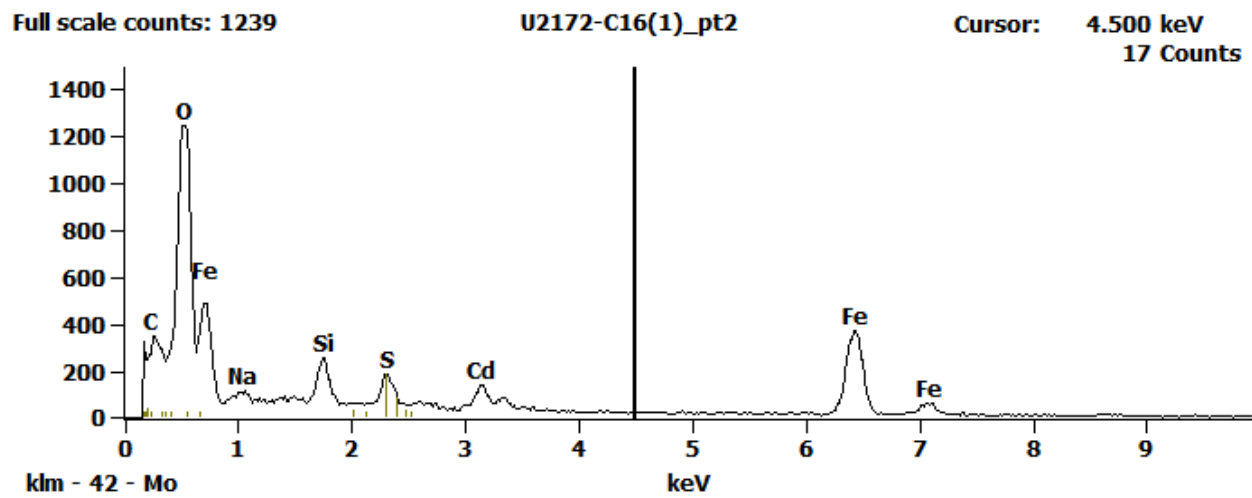


Figure 2. EDS Spectra for sample U2172-C16 taken at test area 2. The test area is labeled in the particle SEM photo.

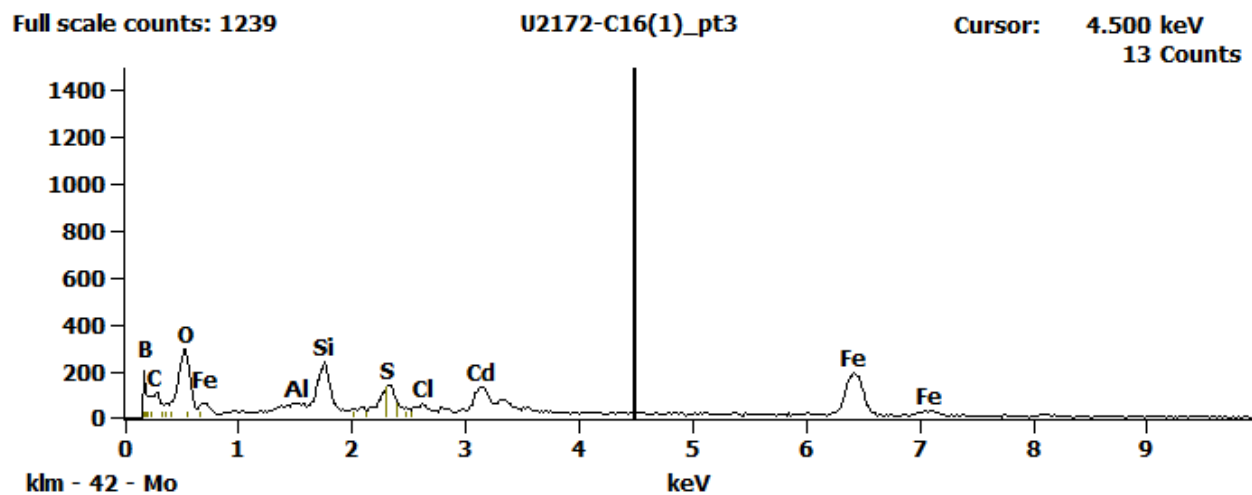


Figure 3. EDS Spectra for sample U2172-C16 taken at test area 3. The test area is labeled in the particle SEM photo.

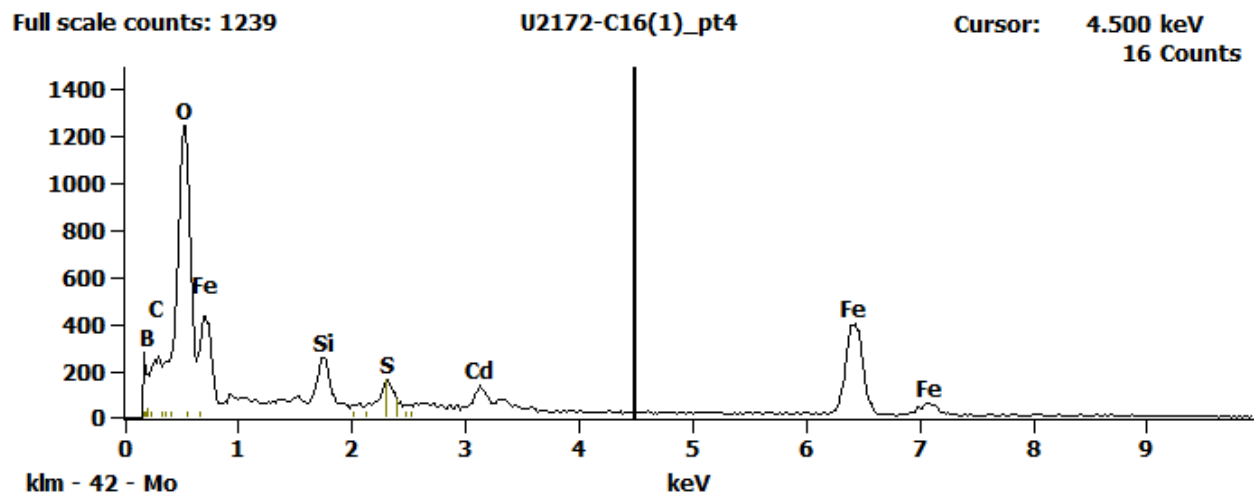
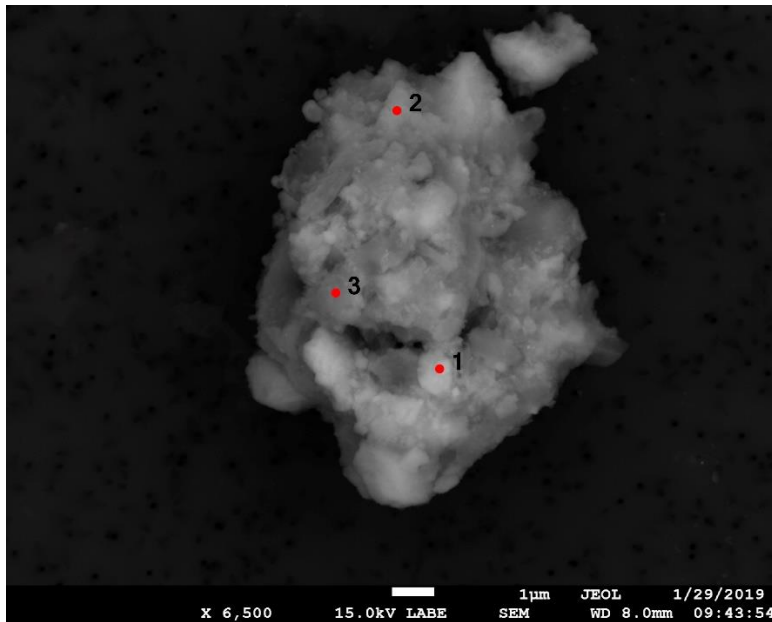


Figure 4. EDS Spectra for sample U2172-C16 taken at test area 4. The test area is labeled in the particle SEM photo.

U2172 D1



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

SEM photo of sample U2172-D1 with labeled EDS testing locations.

U2172 D1 - EDS Spectra

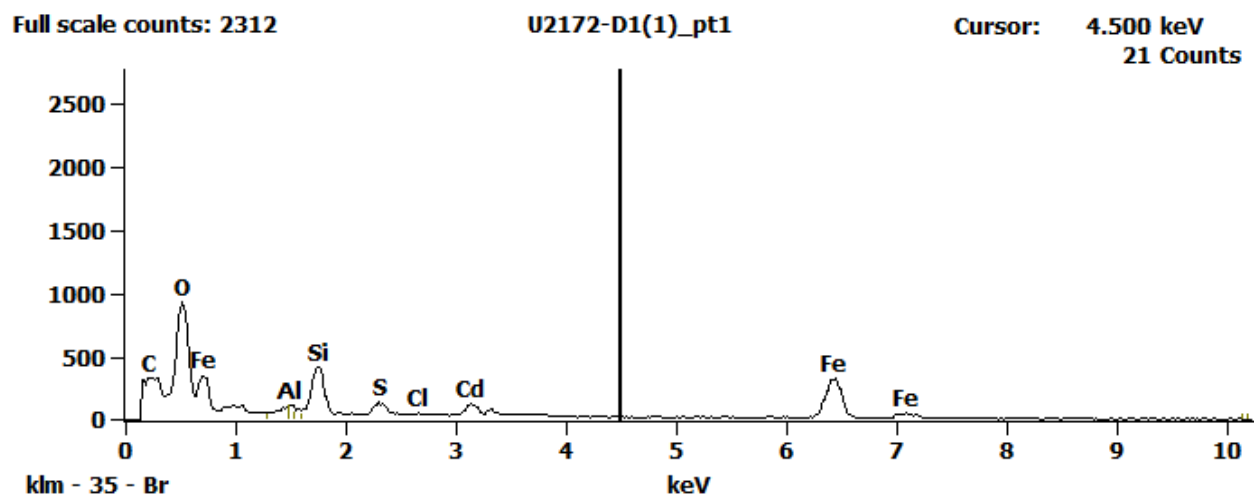


Figure 1. EDS spectra for sample U2172-D1 taken at test area 1. The test area is labeled in the particle SEM photo.

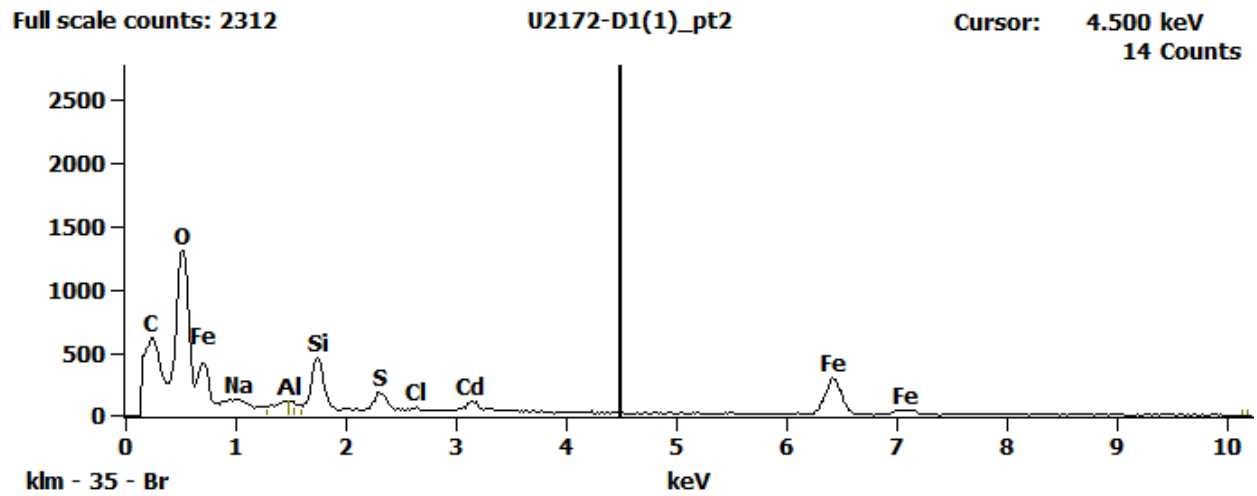


Figure 2. EDS spectra for sample U2172-D1 taken at test area 2. The test area is labeled in the particle SEM photo.

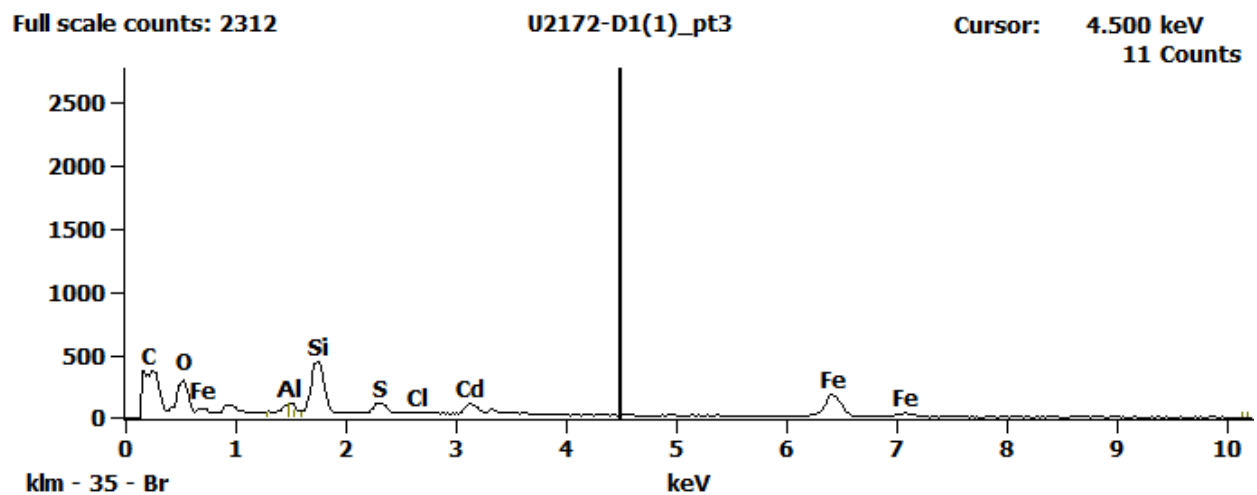
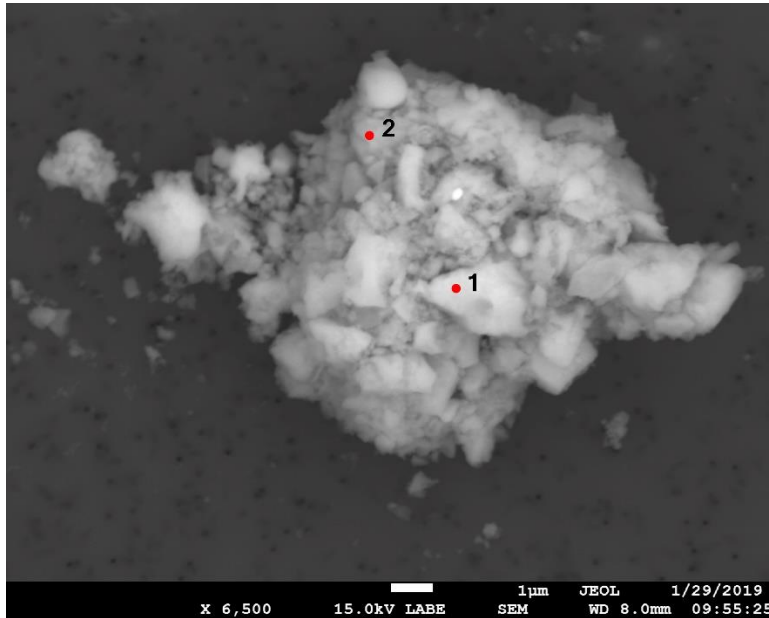


Figure 3. EDS spectra for sample U2172-D1 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D2



Particle Size:	12 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, BROWN
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-D2 with labeled EDS testing locations.

U2172 D2 - EDS Spectra

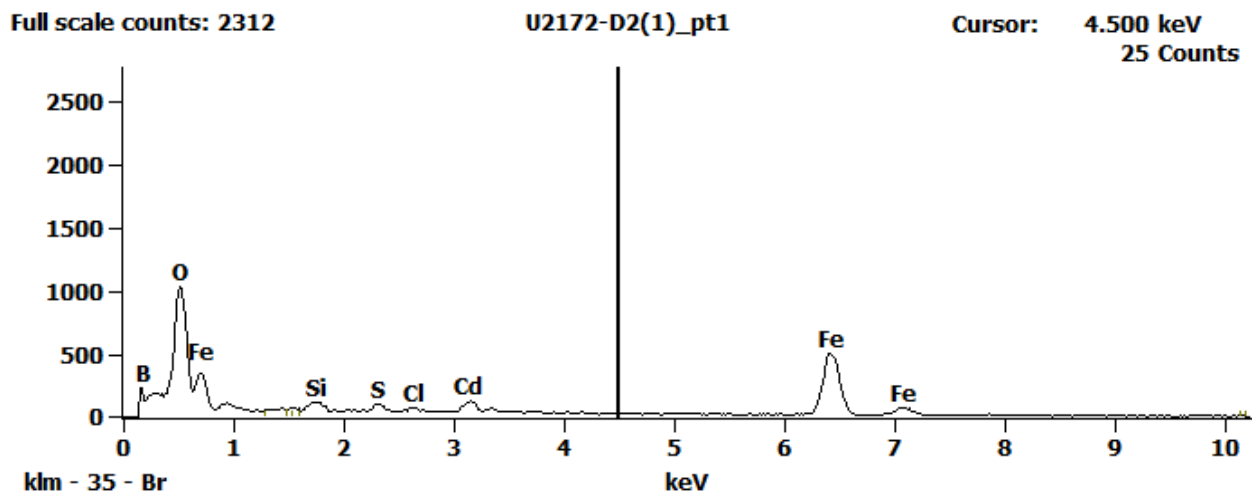


Figure 1. EDS spectra for sample U2172-D2 taken at test area 1. The test area is labeled in the particle SEM photo.

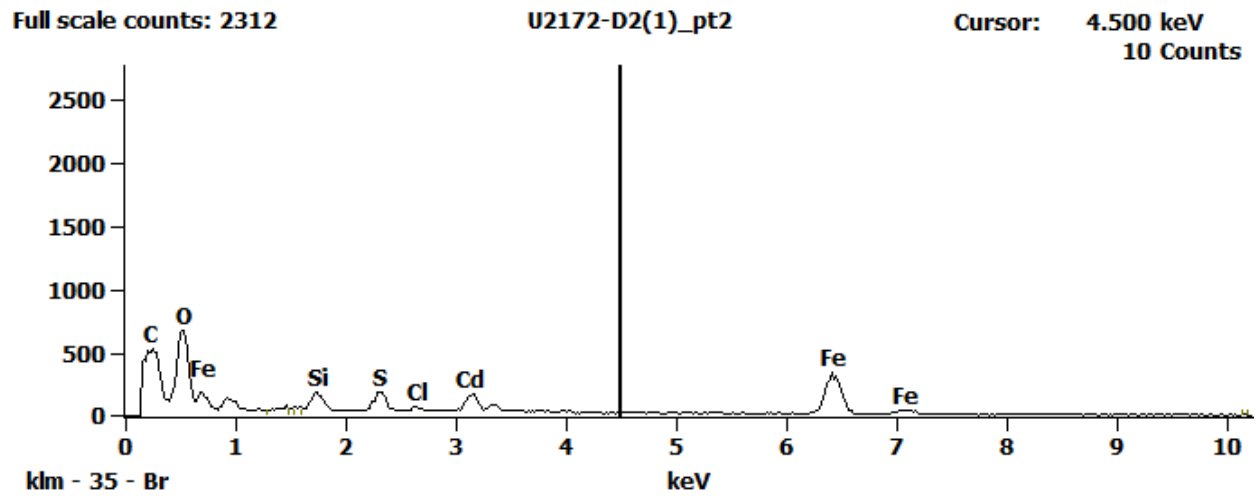
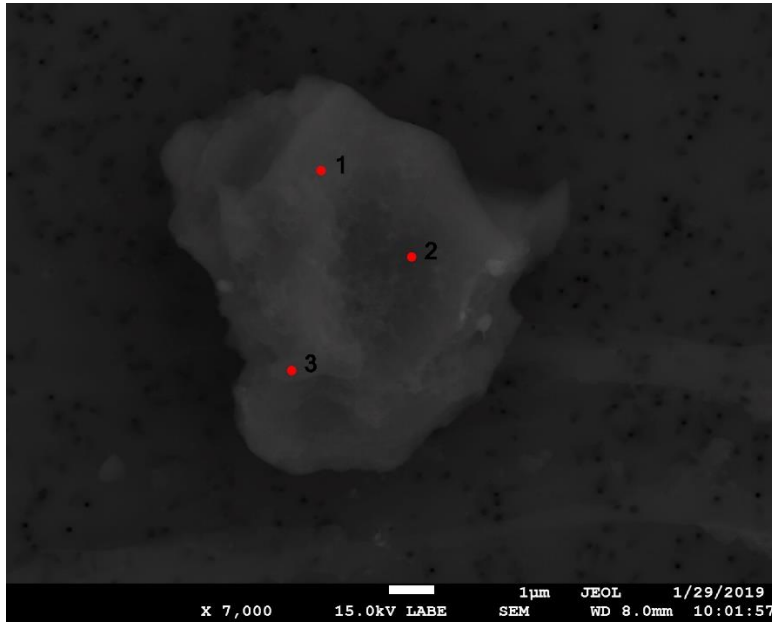


Figure 2. EDS spectra for sample U2172-D2 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 D3



Particle Size:	10 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-D3 with labeled EDS testing locations.

U2172 D3 - EDS Spectra

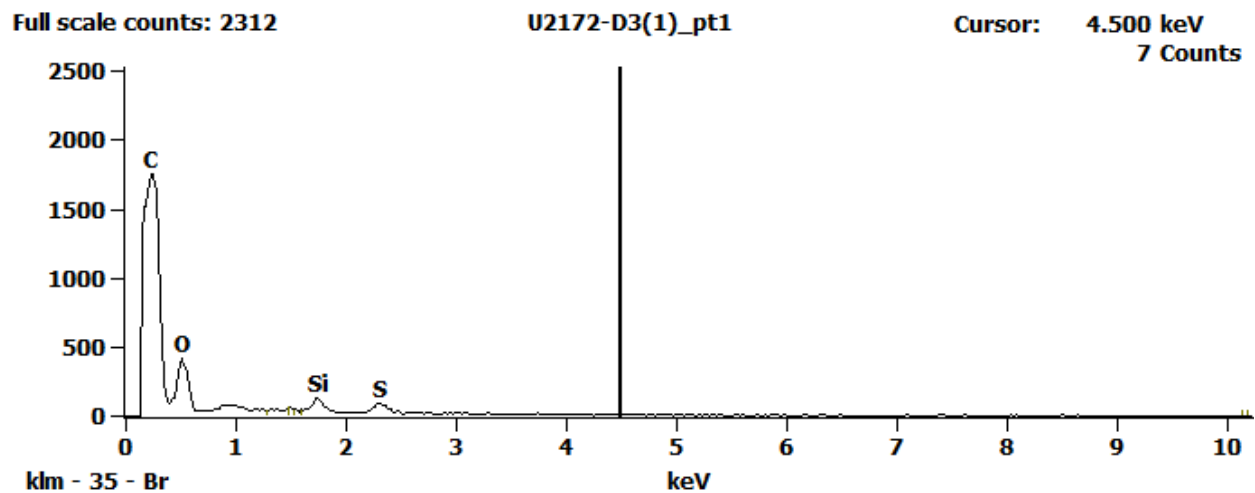


Figure 1. EDS spectra for sample U2172-D3 taken at test area 1. The test area is labeled in the particle SEM photo.

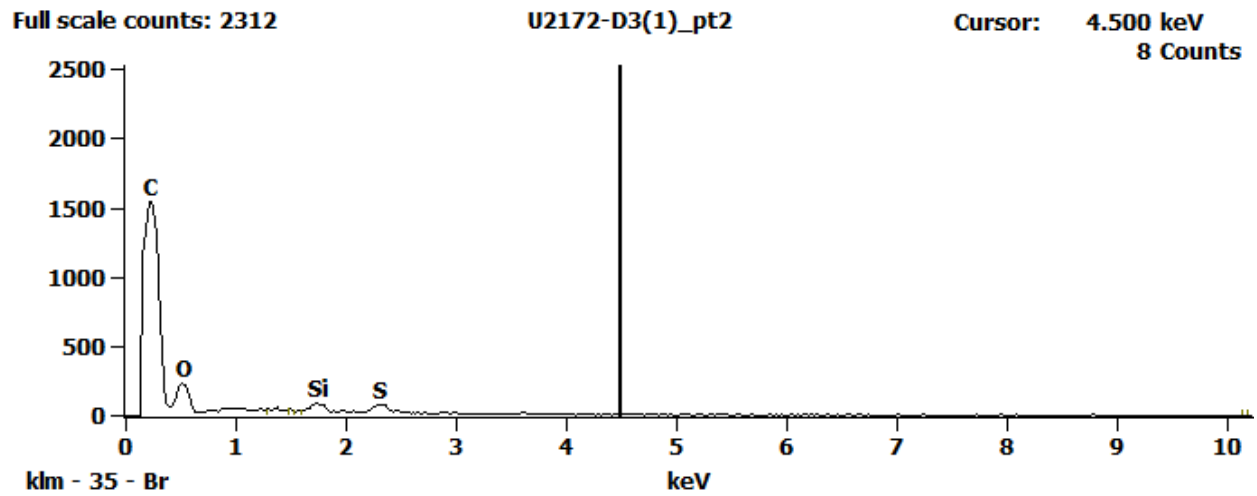


Figure 2. EDS spectra for sample U2172-D3 taken at test area 2. The test area is labeled in the particle SEM photo.

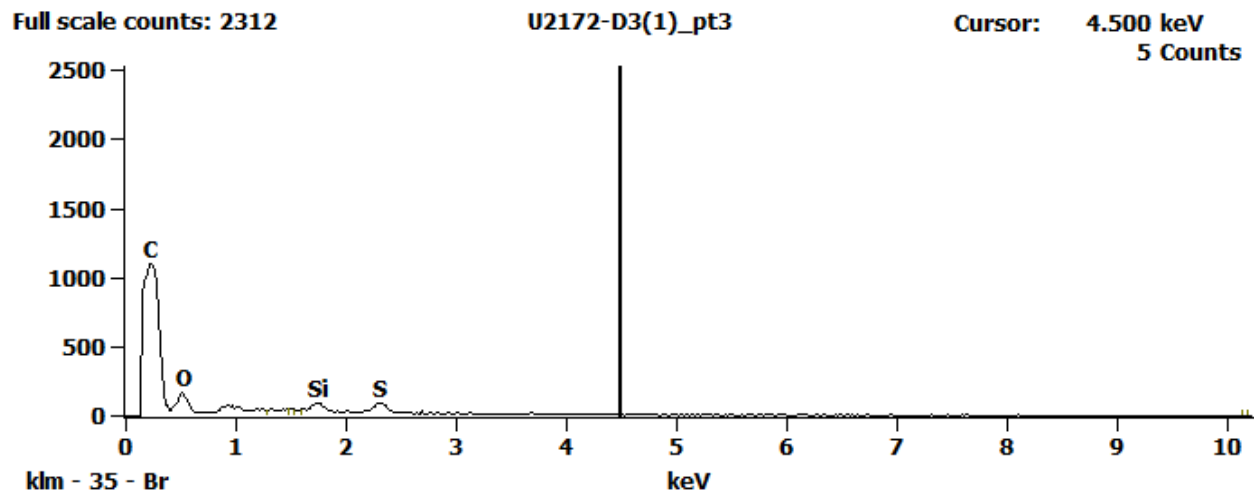
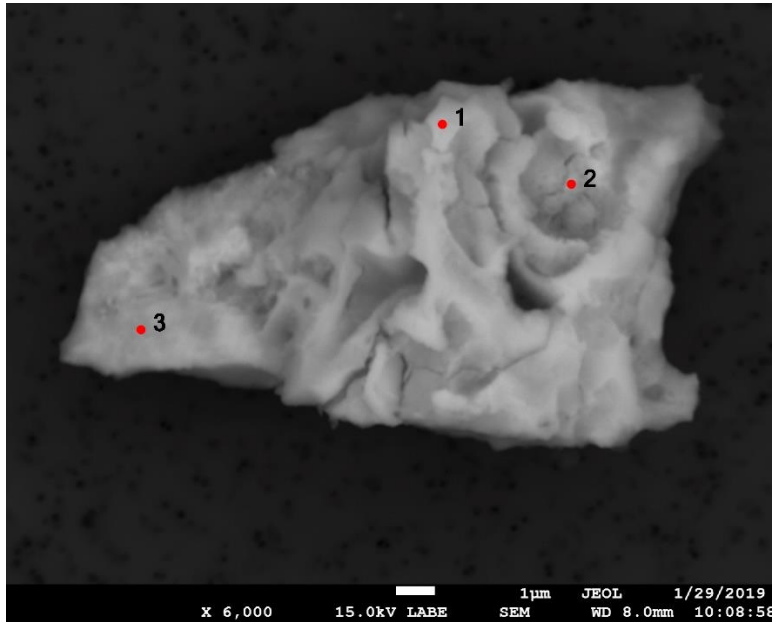


Figure 3. EDS spectra for sample U2172-D3 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D4



SEM photo of sample U2172-D4 with labeled EDS testing locations.

Particle Size:	16 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

U2172 D4 - EDS Spectra

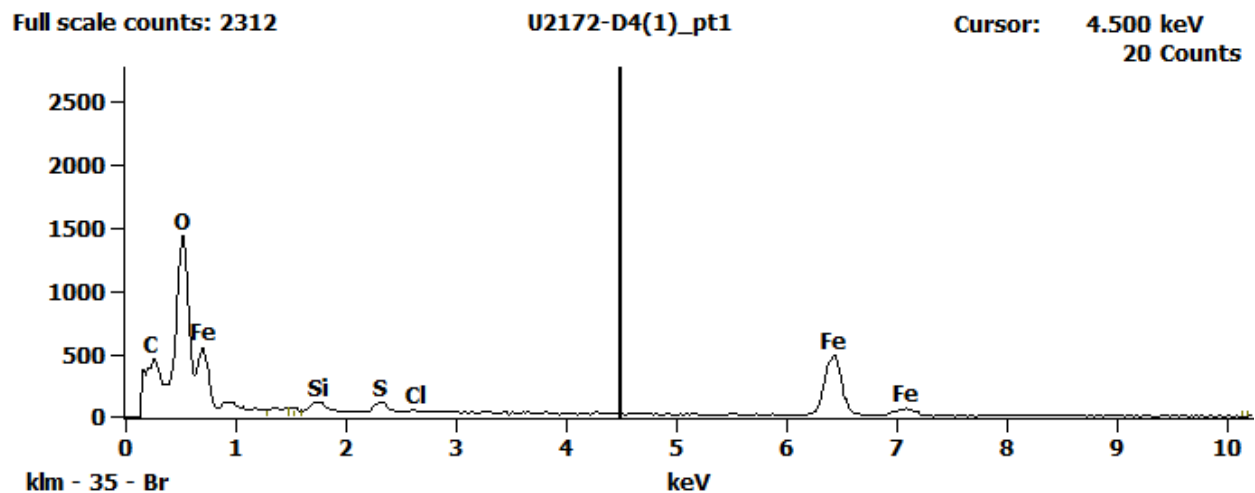


Figure 1. EDS spectra for sample U2172-D4 taken at test area 1. The test area is labeled in the particle SEM photo.

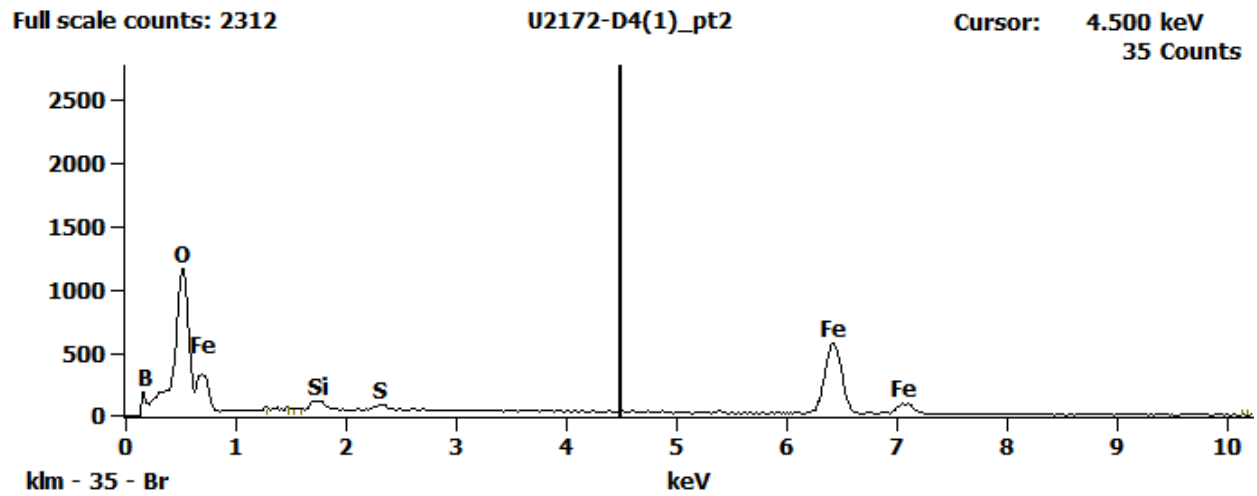


Figure 2. EDS spectra for sample U2172-D4 taken at test area 2. The test area is labeled in the particle SEM photo.

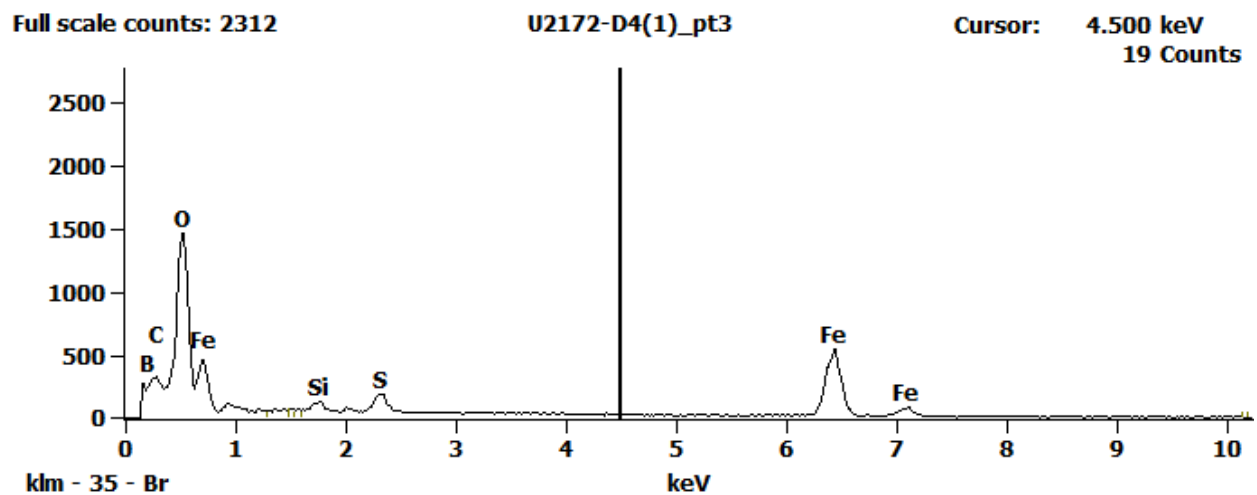
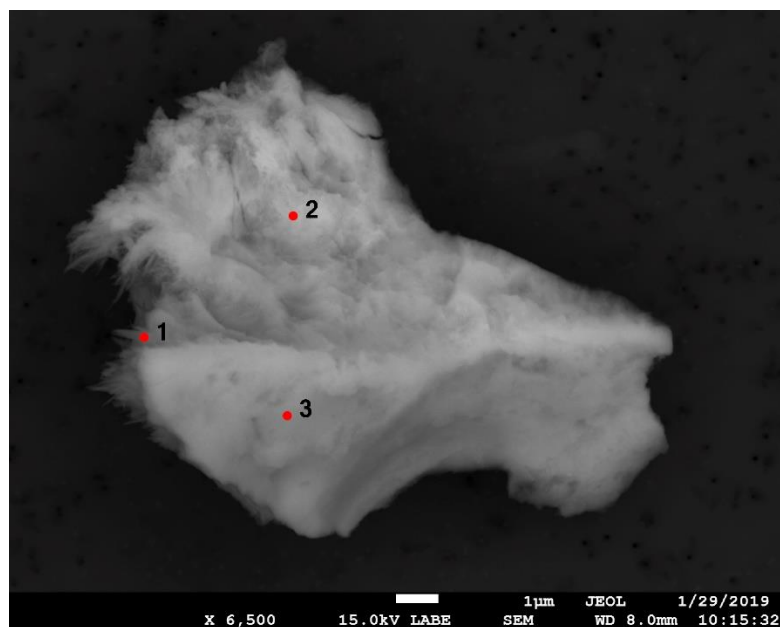


Figure 3. EDS spectra for sample U2172-D4 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D5



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

SEM photo of sample U2172-D5 with labeled EDS testing locations.

U2172 D5 - EDS Spectra

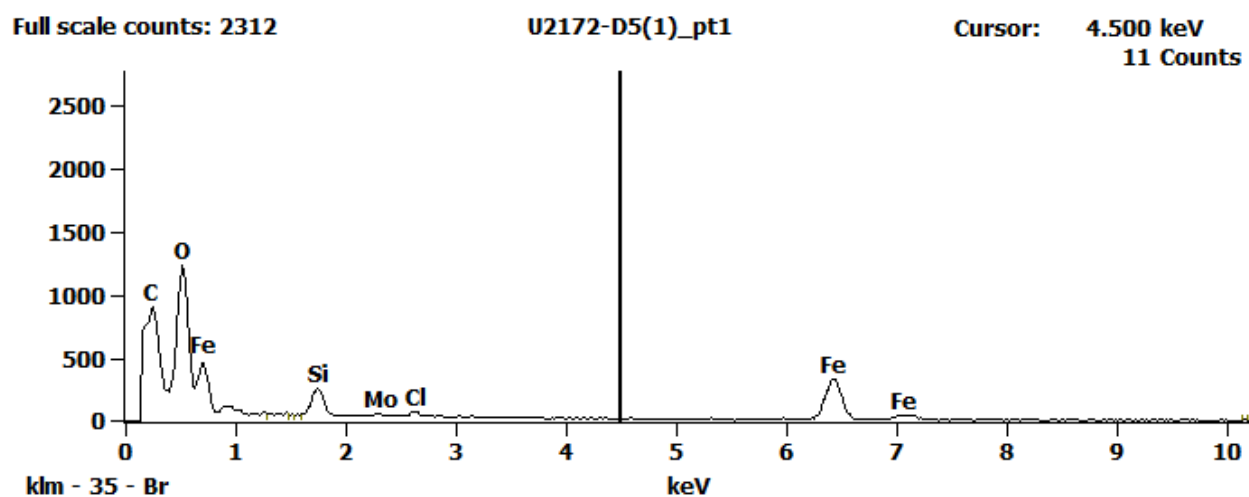


Figure 1. EDS spectra for sample U2172-D5 taken at test area 1. The test area is labeled in the particle SEM photo.

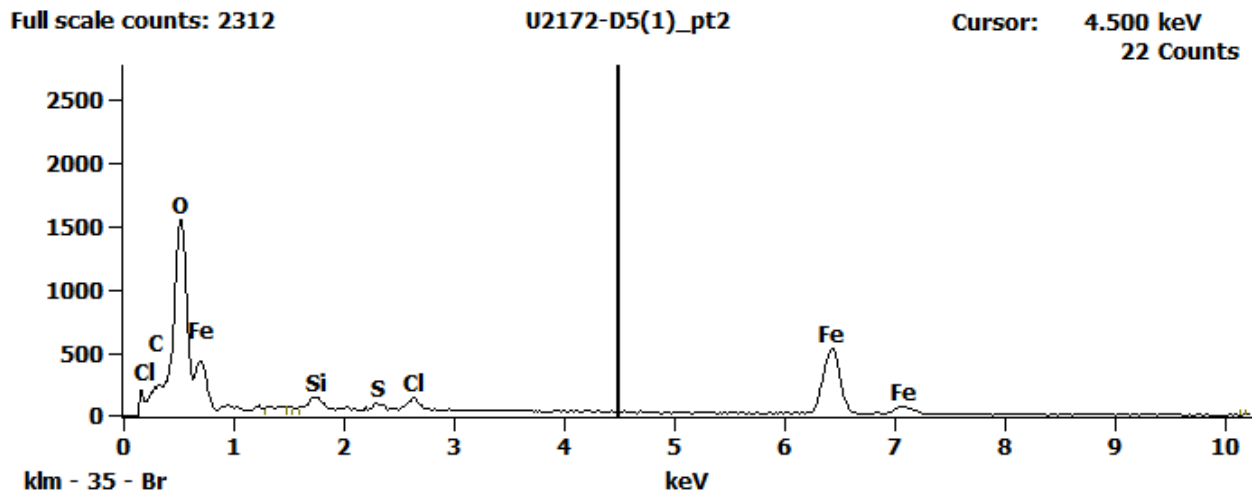


Figure 2. EDS spectra for sample U2172-D5 taken at test area 2. The test area is labeled in the particle SEM photo.

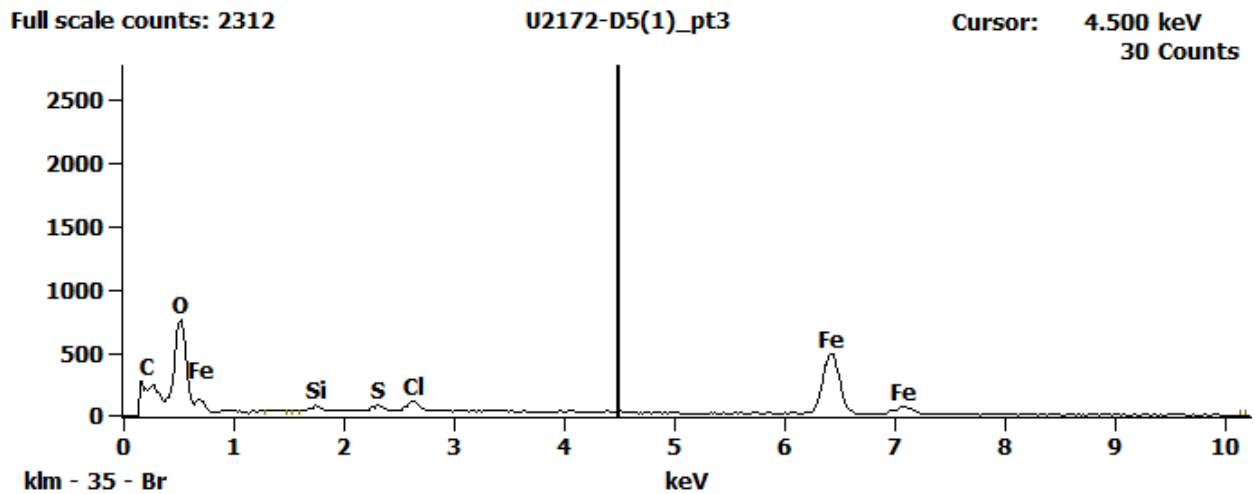
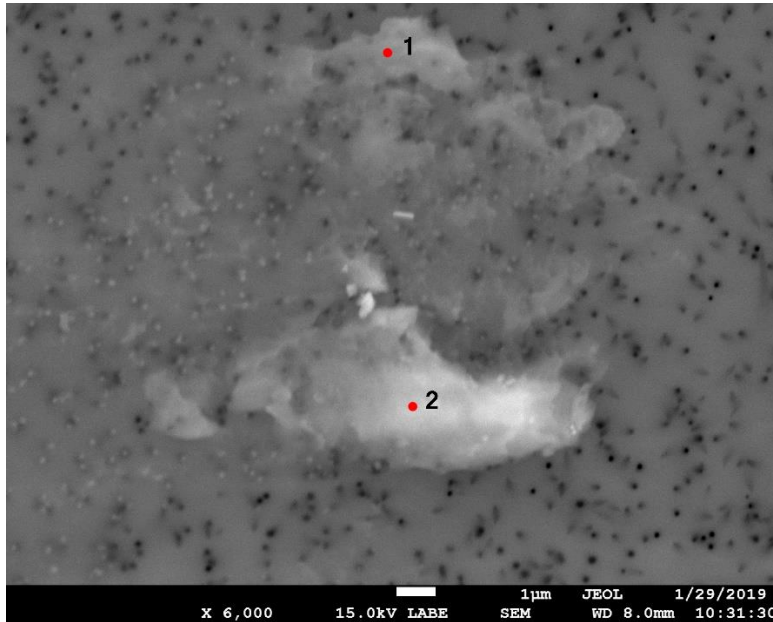


Figure 3. EDS spectra for sample U2172-D5 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D9



Particle Size:	12 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK, BROWN
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-D9 with labeled EDS testing locations.

U2172 D9 - EDS Spectra

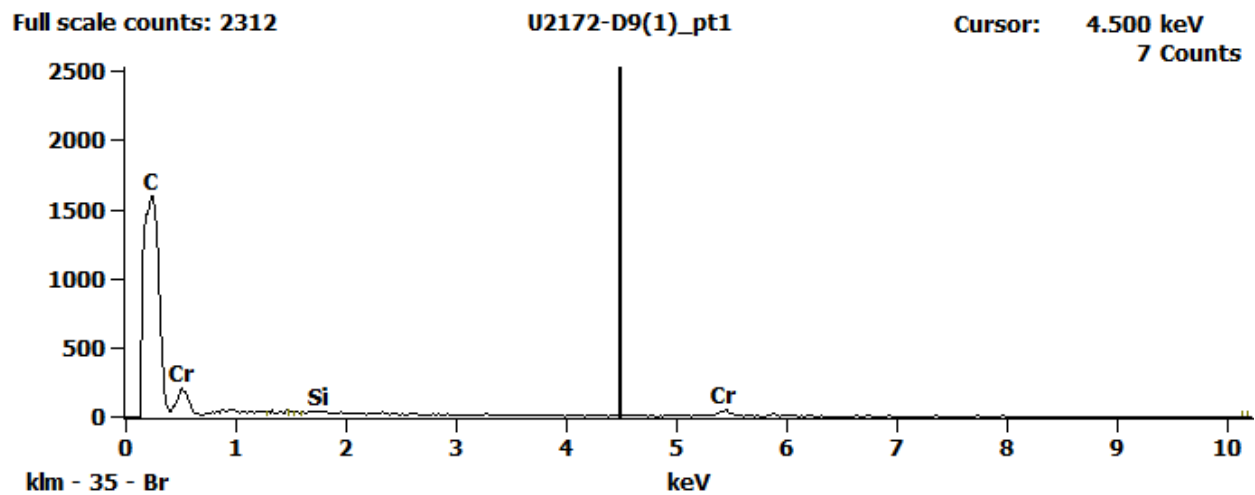


Figure 1. EDS spectra for sample U2172-D9 taken at test area 1. The test area is labeled in the particle SEM photo.

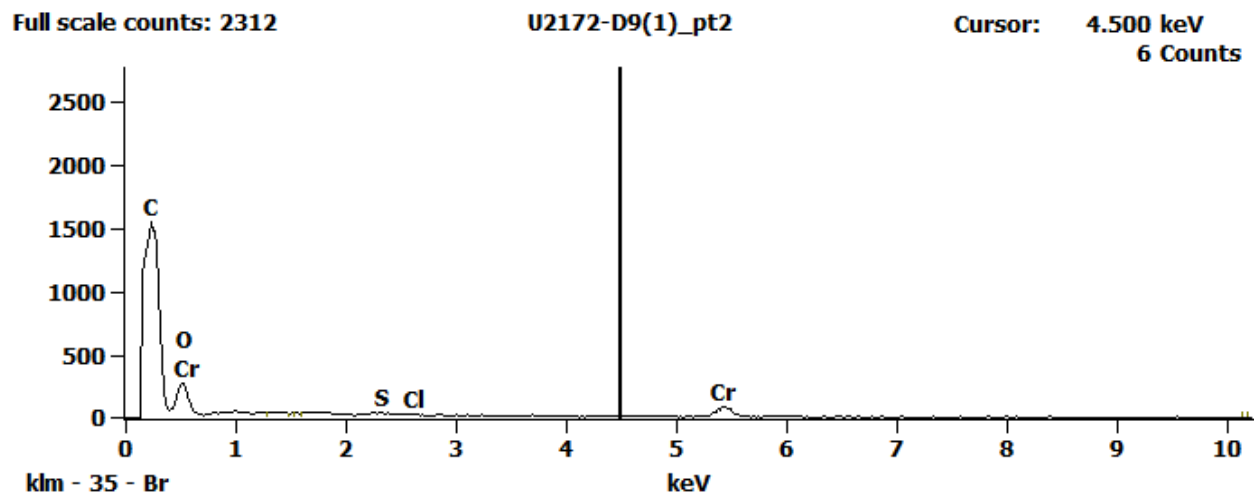
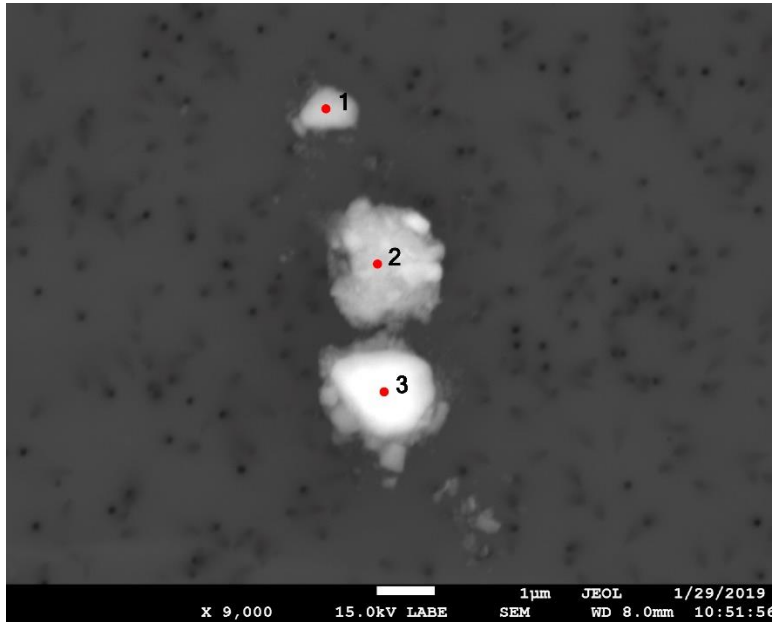


Figure 2. EDS spectra for sample U2172-D9 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 D13



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

SEM photo of sample U2172-D13 with labeled EDS testing locations.

U2172 D13 - EDS Spectra

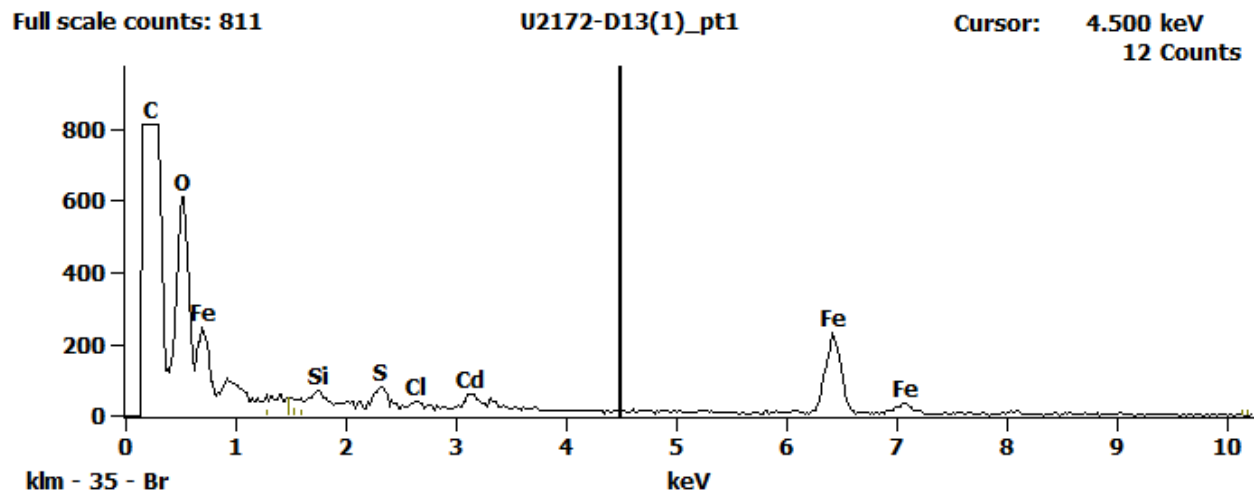


Figure 1. EDS spectra for sample U2172-D13 taken at test area 1. The test area is labeled in the particle SEM photo.

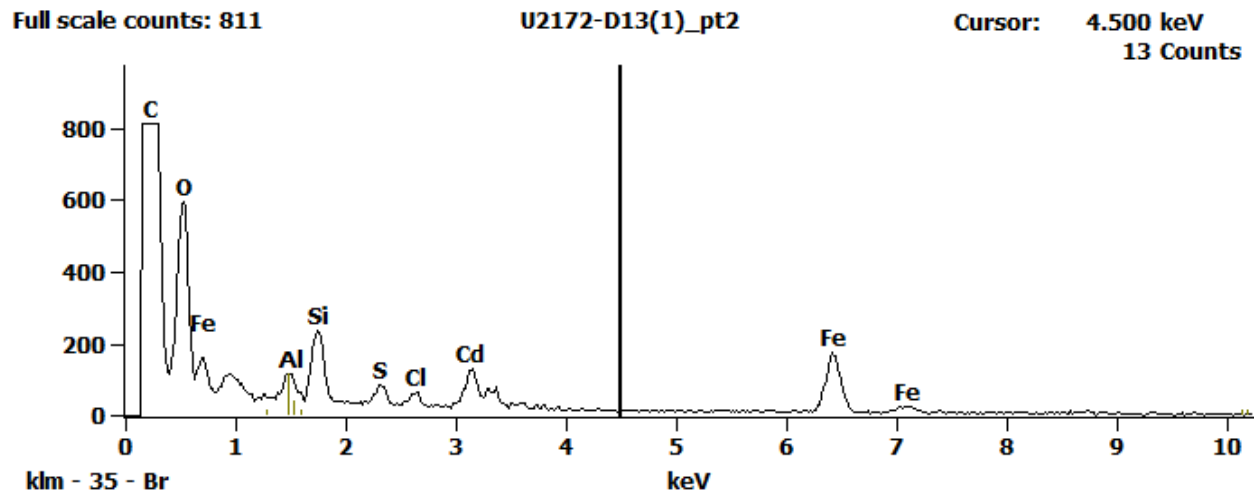


Figure 2. EDS spectra for sample U2172-D13 taken at test area 2. The test area is labeled in the particle SEM photo.

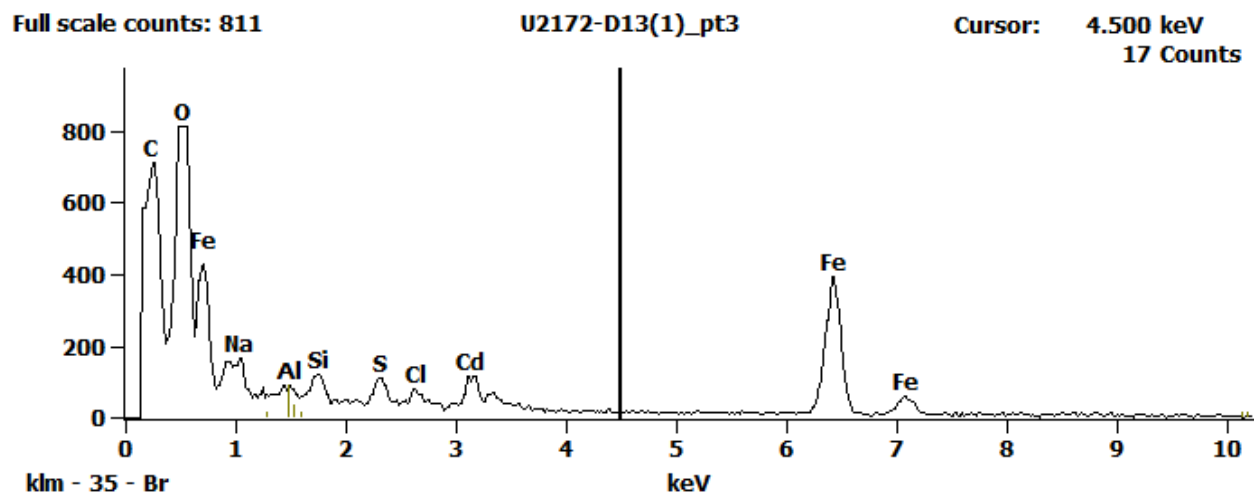
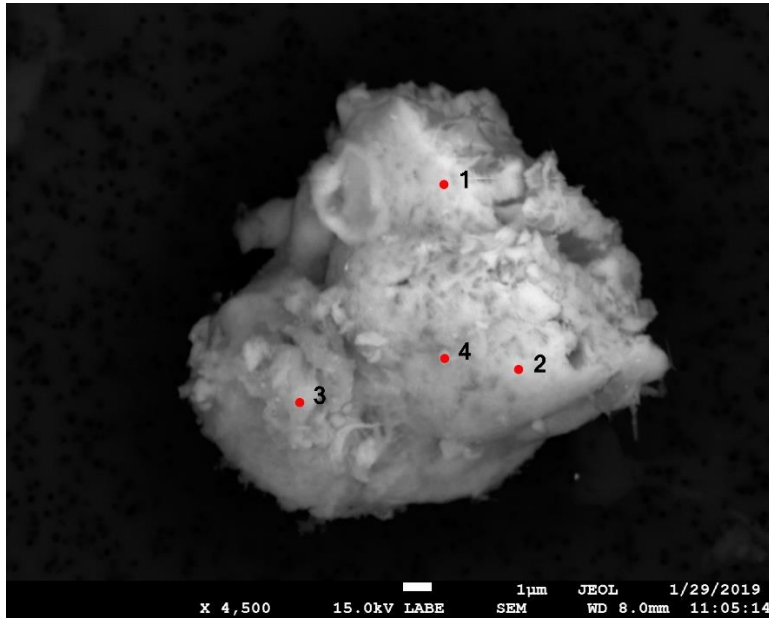


Figure 3. EDS spectra for sample U2172-D13 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D16



Particle Size:	12 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Dull
Particle Type:	POSSIBLY ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-D16 with labeled EDS testing locations.

U2172 D16 - EDS Spectra

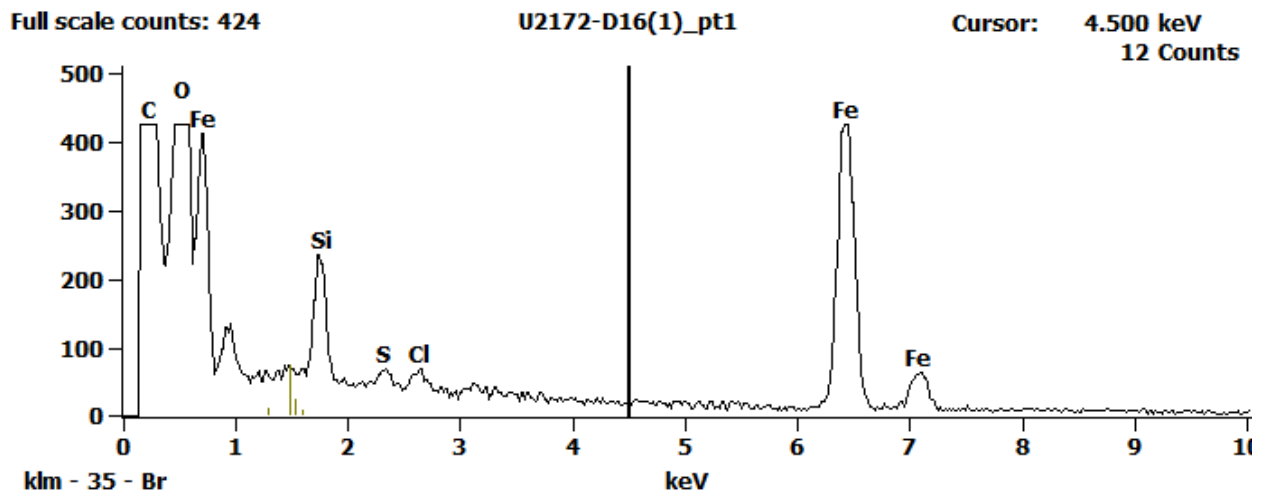


Figure 1. EDS spectra for sample U2172-D16 taken at test area 1. The test area is labeled in the particle SEM photo.

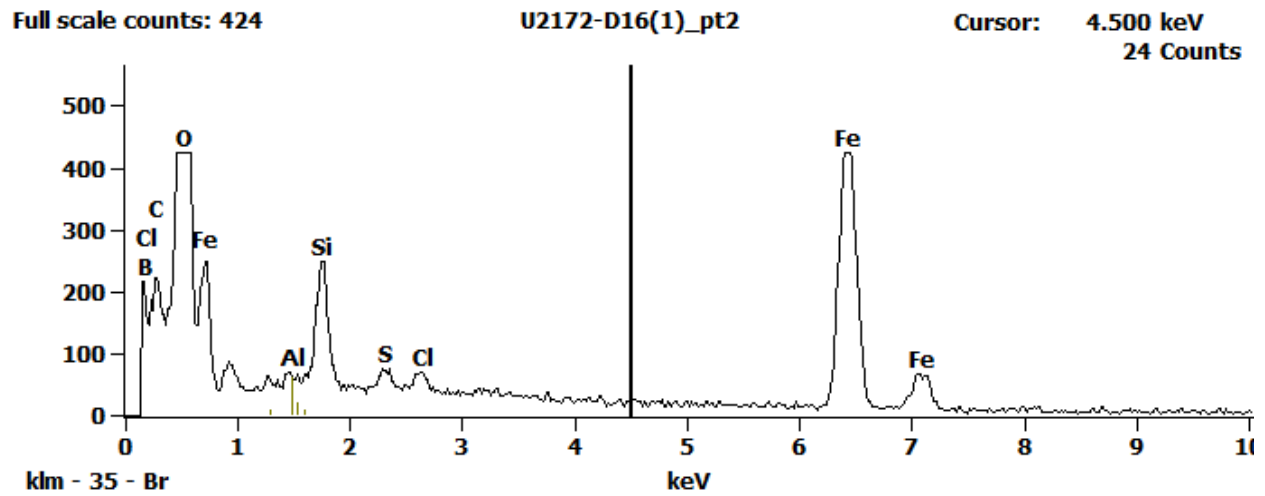


Figure 2. EDS spectra for sample U2172-D16 taken at test area 2. The test area is labeled in the particle SEM photo.

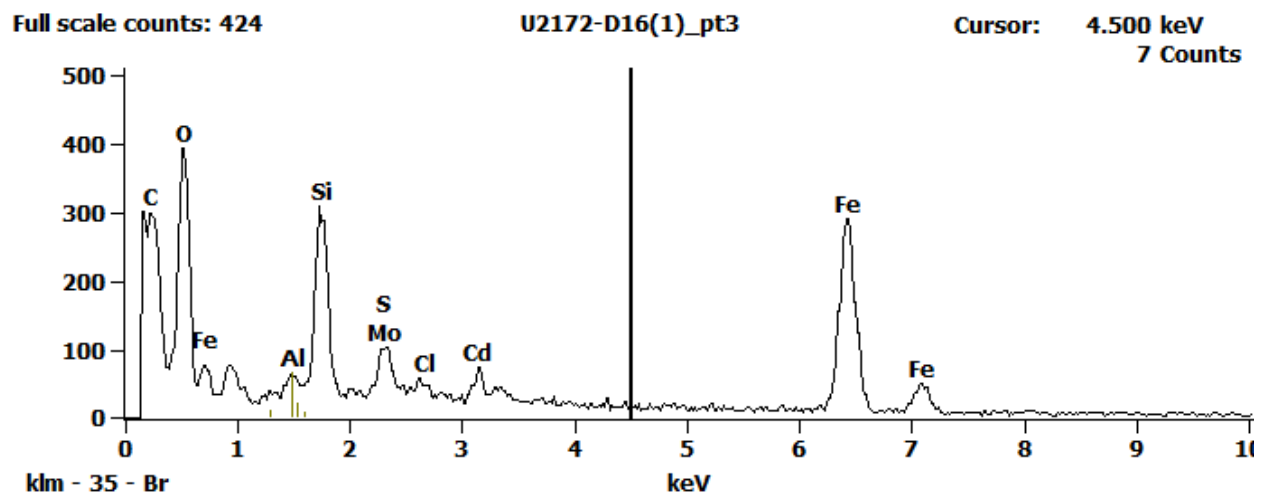


Figure 3. EDS spectra for sample U2172-D16 taken at test area 3. The test area is labeled in the particle SEM photo.

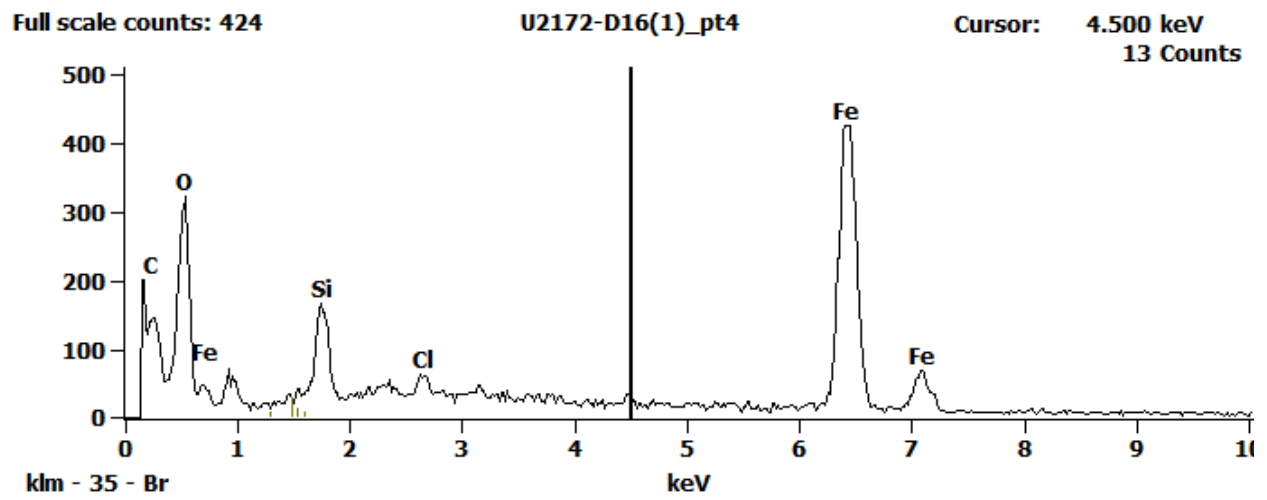
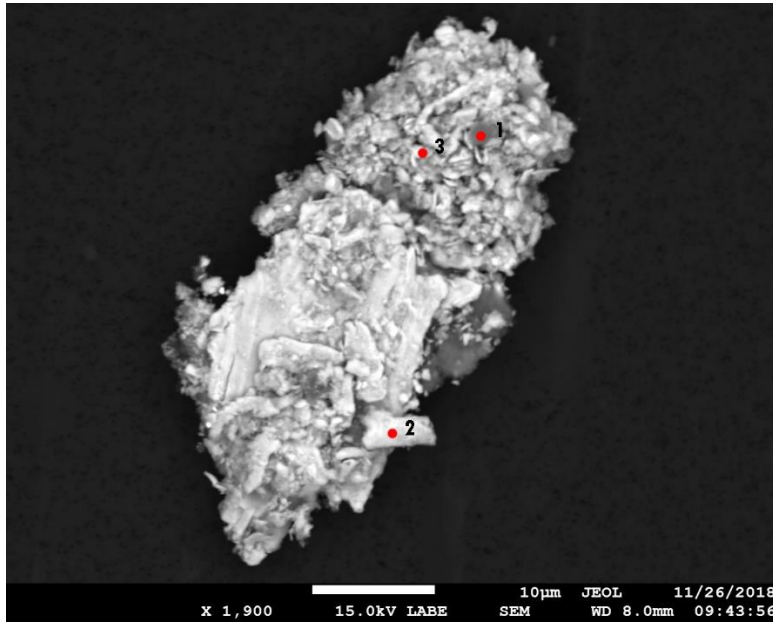


Figure 4. EDS spectra for sample U2172-D16 taken at test area 4. The test area is labeled in the particle SEM photo.

W7016 A3



Particle Size:	38x25 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Pearly to Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-3 with labeled EDS testing locations.

W7016 A3 - EDS Spectra

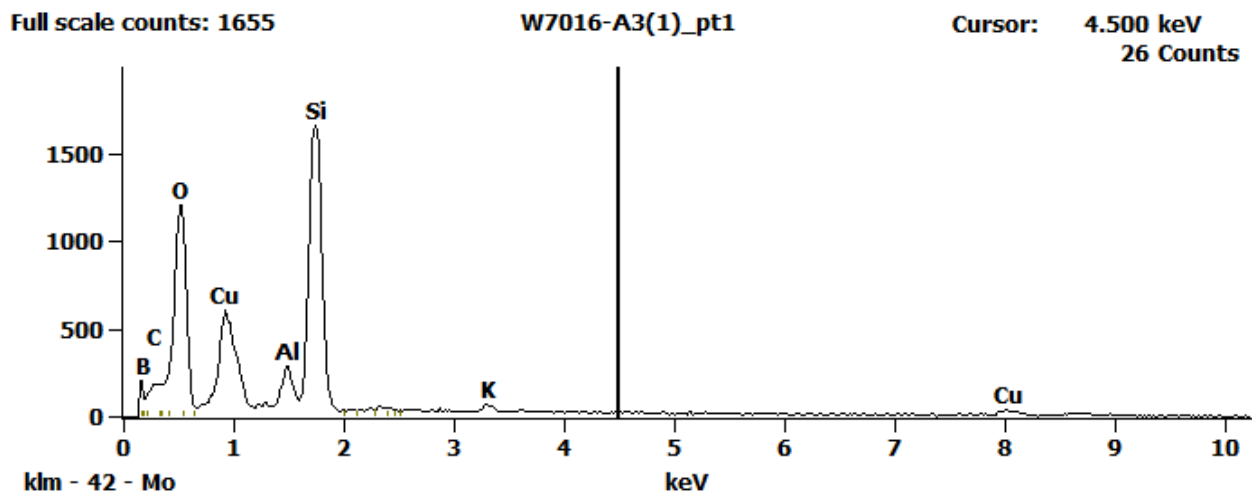


Figure 1. EDS spectra for sample W7016-A-3 taken at test area 1. The test area is labeled in the particle SEM photo.

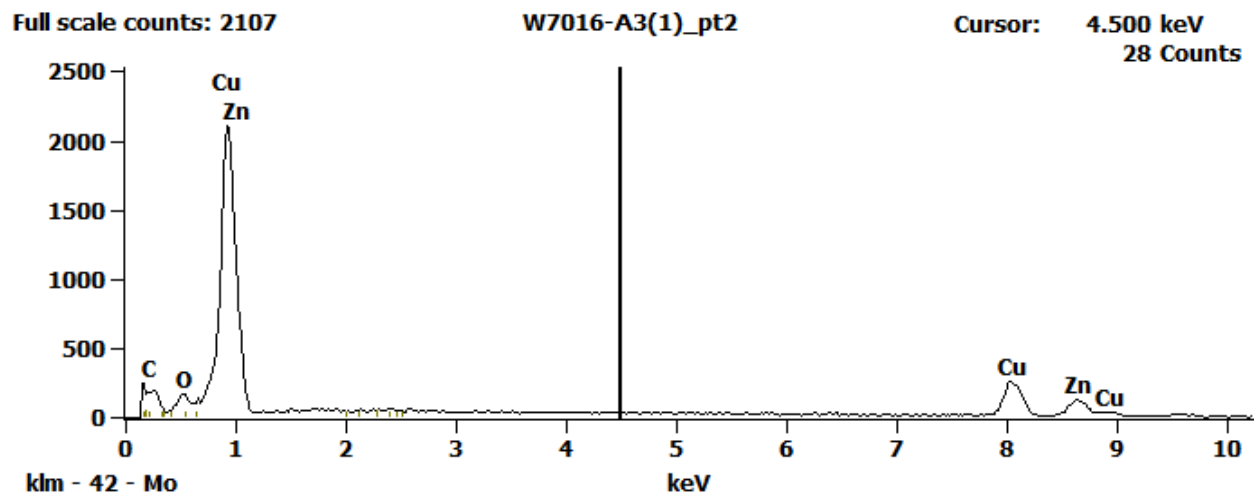


Figure 2. EDS spectra for sample W7016-A-3 taken at test area 2. The test area is labeled in the particle SEM photo.

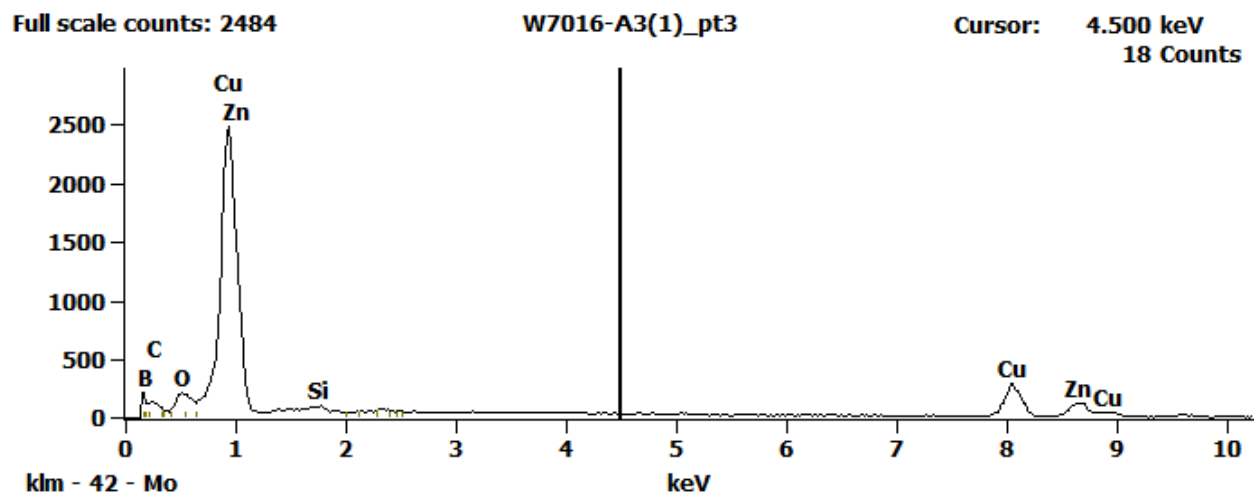
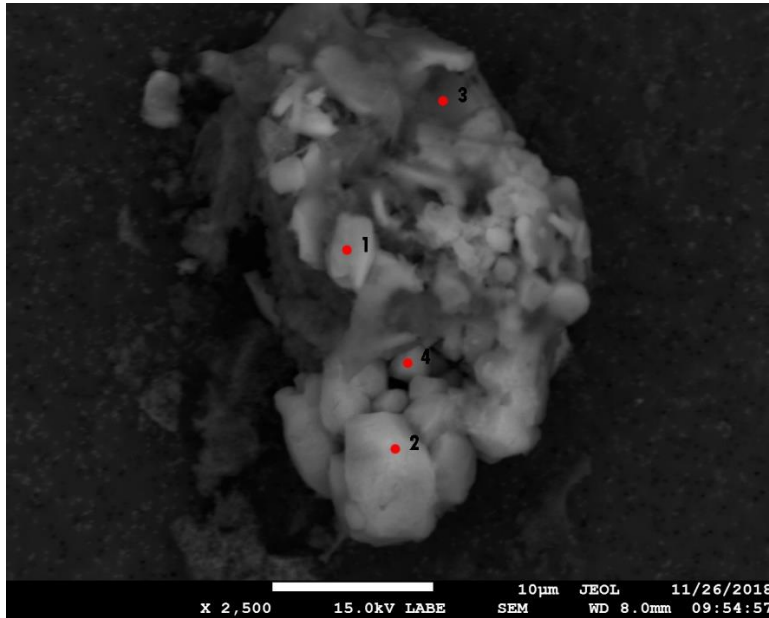


Figure 3. EDS spectra for sample W7016-A-3 taken at test area 3. The test area is labeled in the particle SEM photo.

W7016 A4



Particle Size:	30 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BROWN, RED
Luster:	Resinous
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-4 with labeled EDS testing locations.

W7016 A4 - EDS Spectra

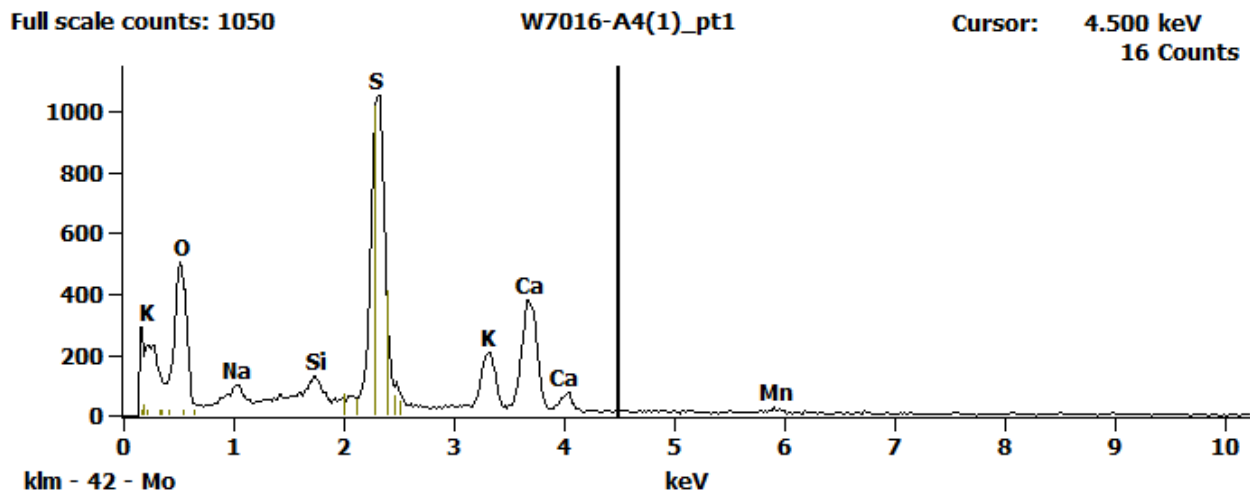


Figure 1. EDS spectra for sample W7016-A-4 taken at test area 1. The test area is labeled in the particle SEM photo.

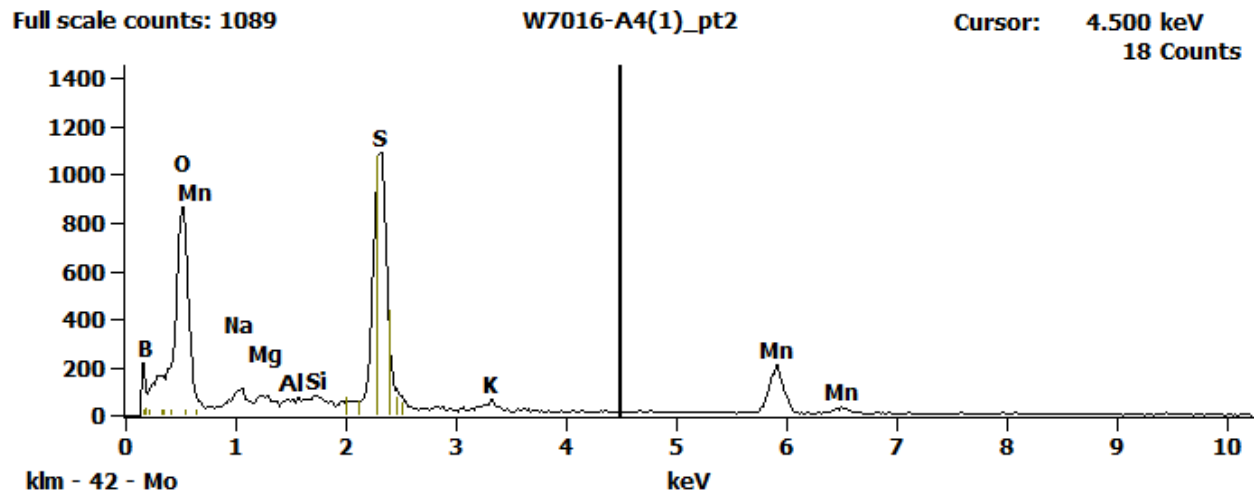


Figure 2. EDS spectra for sample W7016-A-4 taken at test area 2. The test area is labeled in the particle SEM photo.

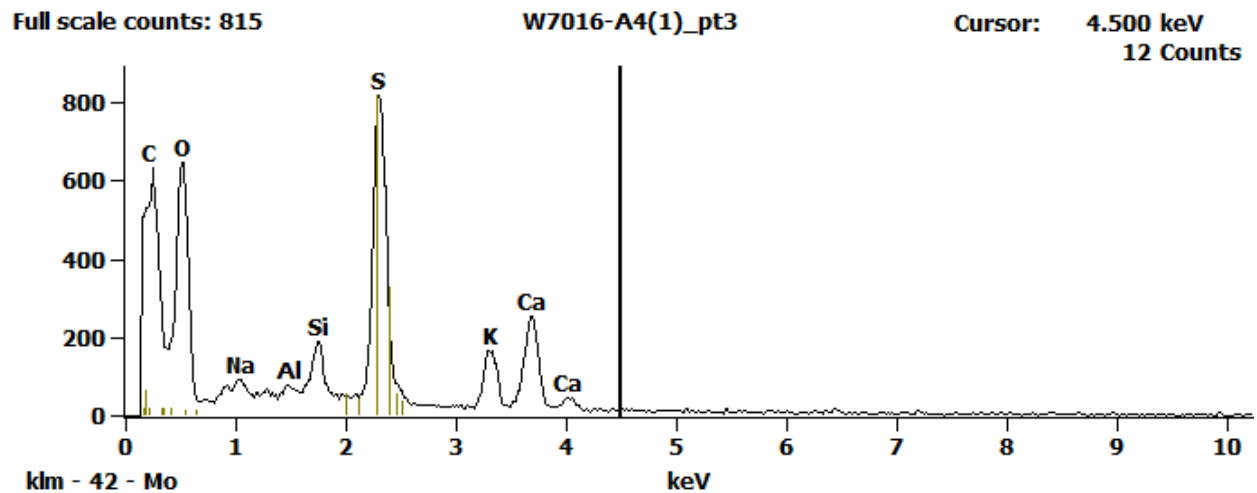


Figure 3. EDS spectra for sample W7016-A-4 taken at test area 3. The test area is labeled in the particle SEM photo.

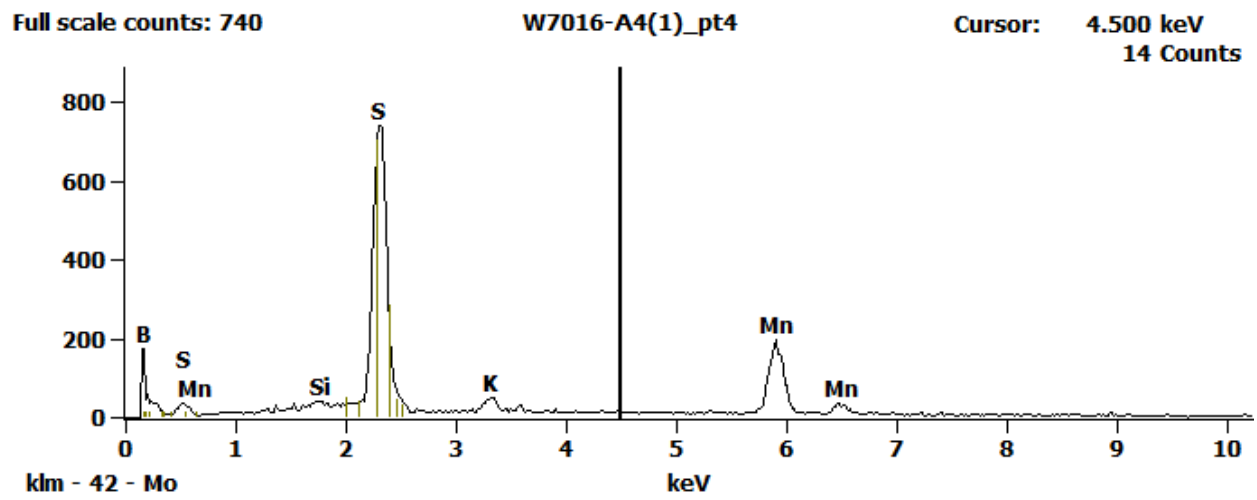
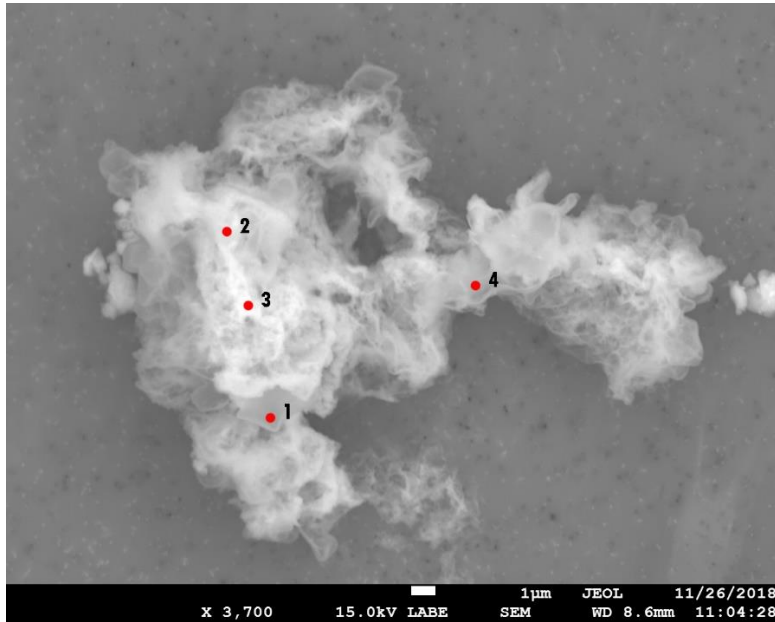


Figure 4. EDS spectra for sample W7016-A-4 taken at test area 4. The test area is labeled in the particle SEM photo.

W7016 A6



Particle Size:	25 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-6 with labeled EDS testing locations.

W7016 A6 - EDS Spectra

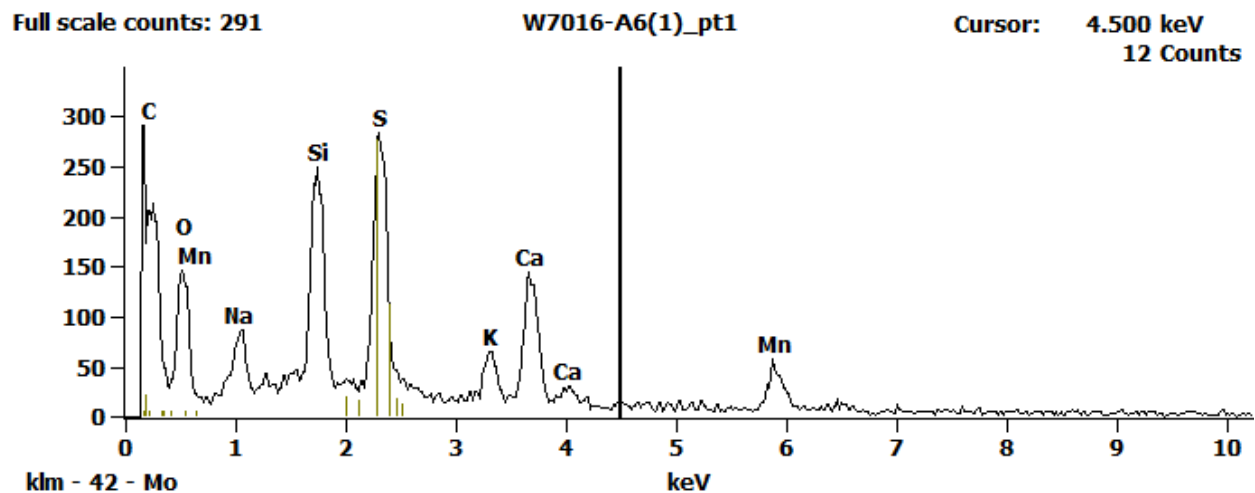


Figure 1. EDS spectra for sample W7016-A-6 taken at test area 1. The test area is labeled in the particle SEM photo.

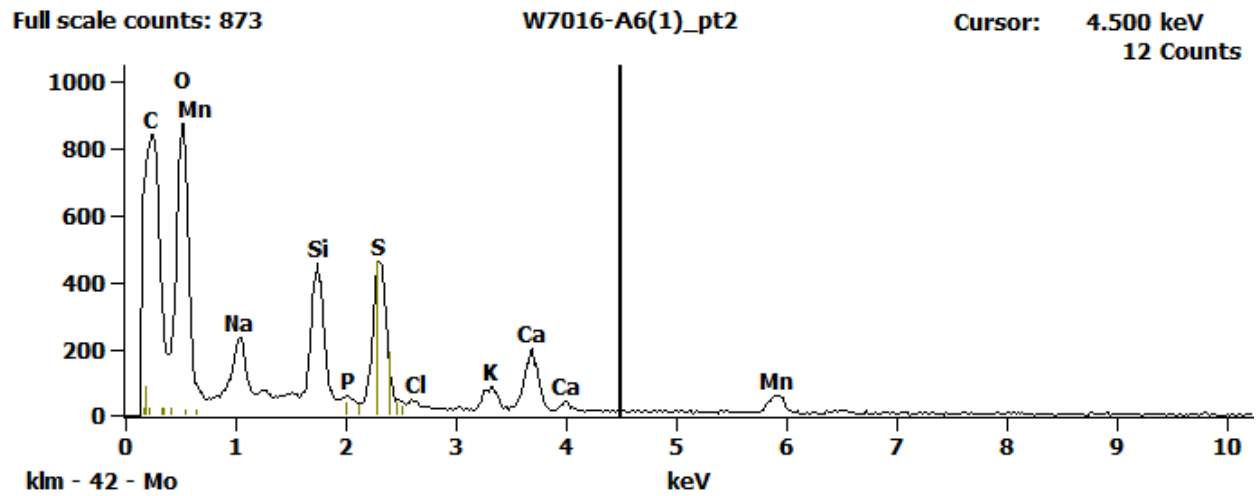


Figure 2. EDS spectra for sample W7016-A-6 taken at test area 2. The test area is labeled in the particle SEM photo.

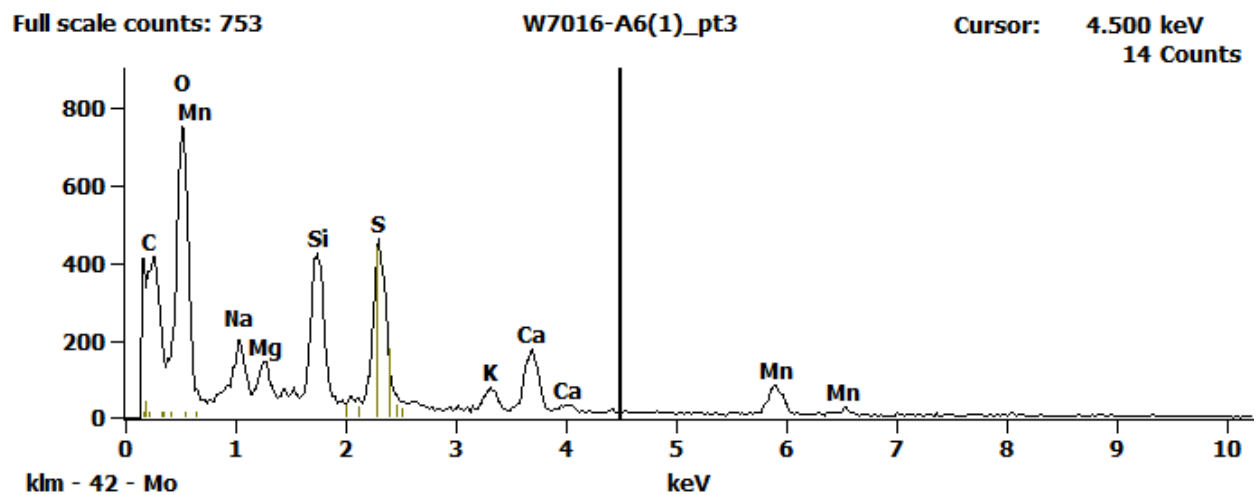


Figure 3. EDS spectra for sample W7016-A-6 taken at test area 3. The test area is labeled in the particle SEM photo.

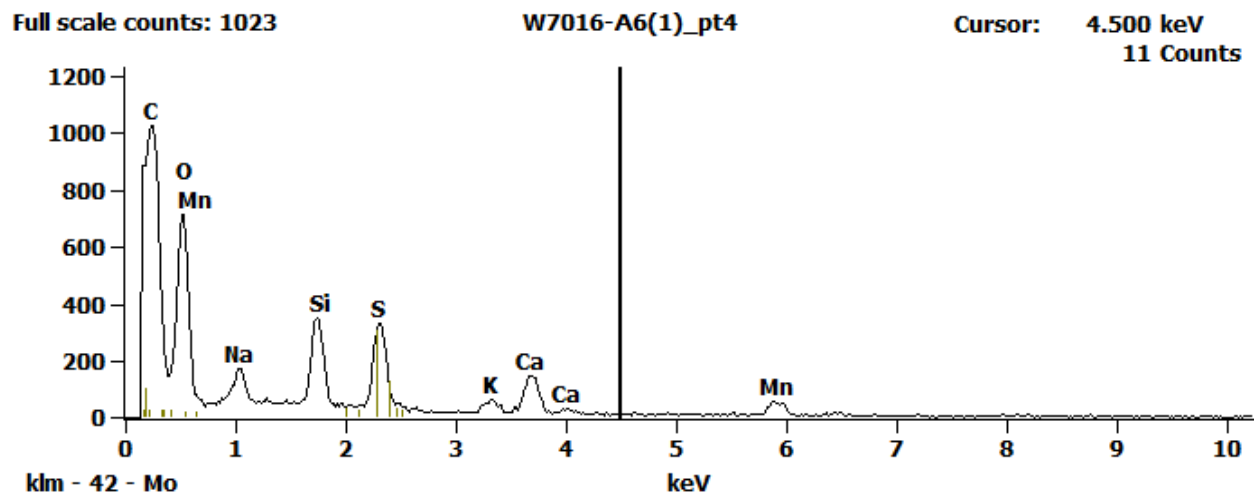
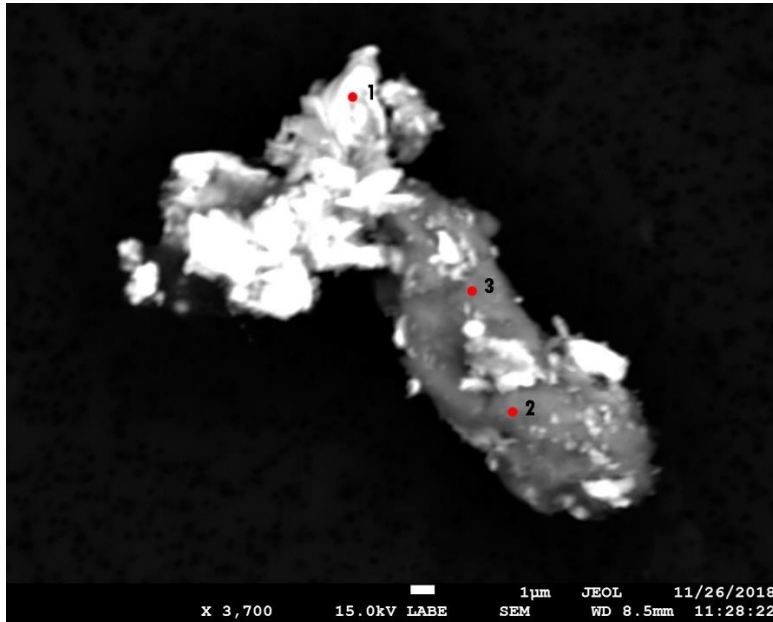


Figure 4. EDS spectra for sample W7016-A-6 taken at test area 4. The test area is labeled in the particle SEM photo.

W7016 A10



Particle Size:	29x15 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	ARTIFICIAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-10 with labeled EDS testing locations.

W7016 A10 - EDS Spectra

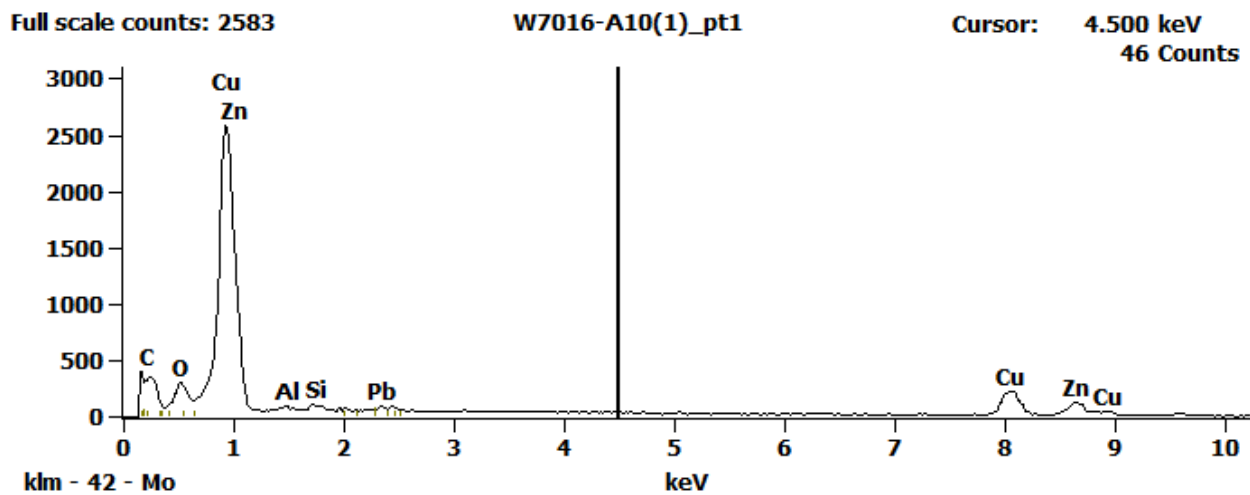


Figure 1. EDS spectra for sample W7016-A-10 taken at test area 1. The test area is labeled in the particle SEM photo.

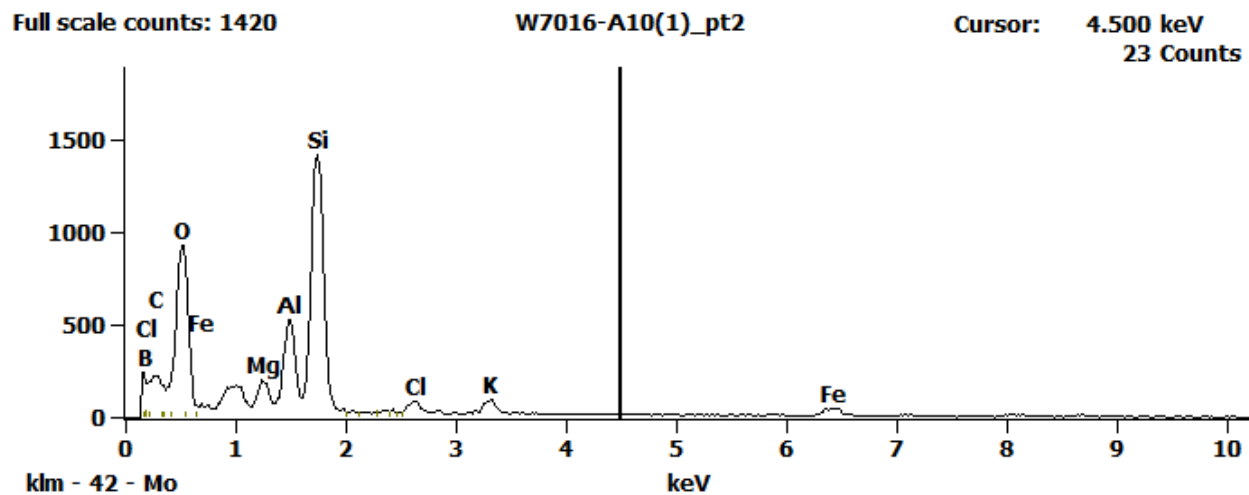


Figure 2. EDS spectra for sample W7016-A-10 taken at test area 2. The test area is labeled in the particle SEM photo.

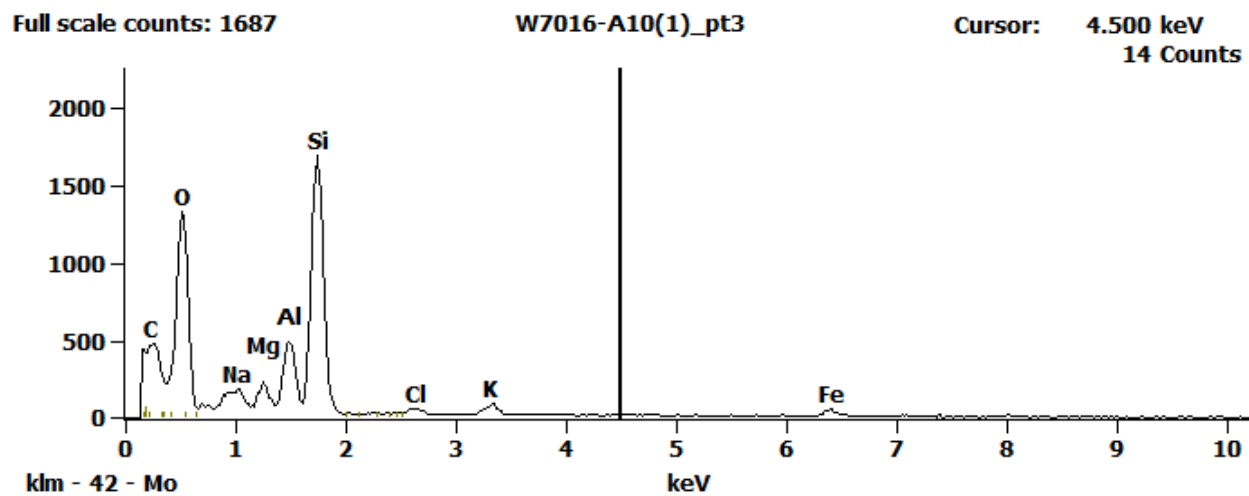
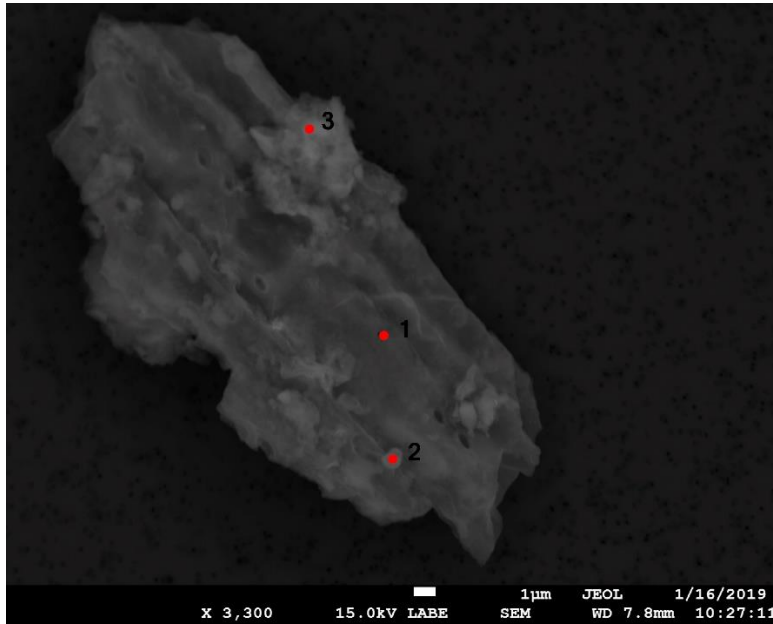


Figure 3. EDS spectra for sample W7016-A-10 taken at test area 3. The test area is labeled in the particle SEM photo.

Particle Descriptions

Natural Terrestrial Contamination and Possibly Natural Terrestrial Contamination (TCN and TCN ? Types)

U2170 B9



Particle Size:	17x27 μm
Shape:	Equidimensional
Transparency:	Opaque
Color:	GRAY
Luster:	Pearly to Dull
Particle Type:	POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.:	U2170 Cluster 13
Comments:	

SEM photo of sample U2170-B9 with labeled EDS testing locations.

Cluster of Origin: U2170 Cluster 13

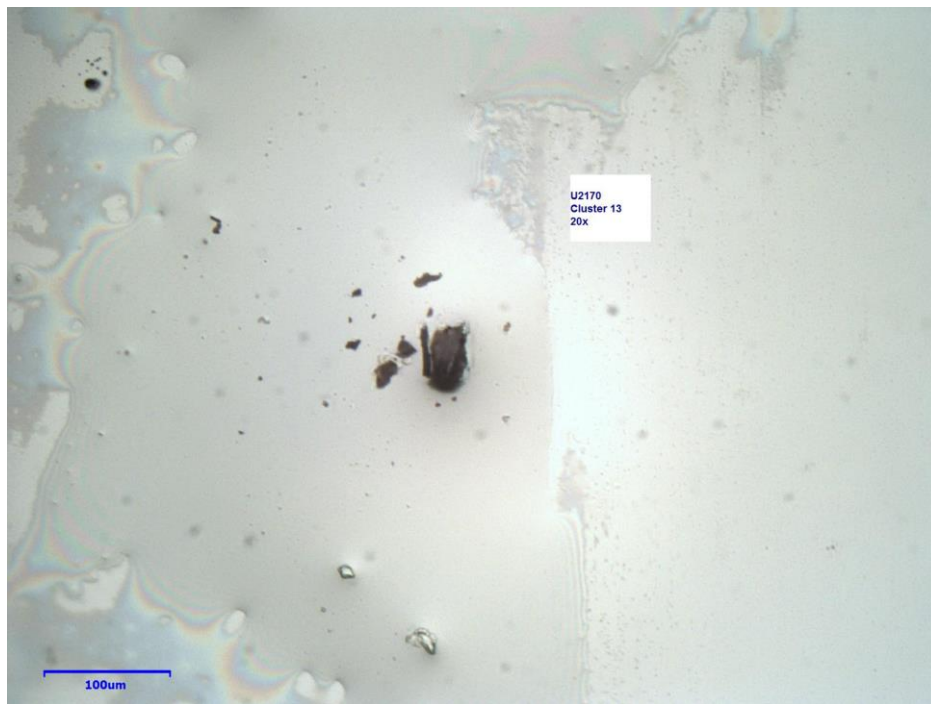


Photo of cluster U2170 Cluster 13.

U2170 B9 - EDS Spectra

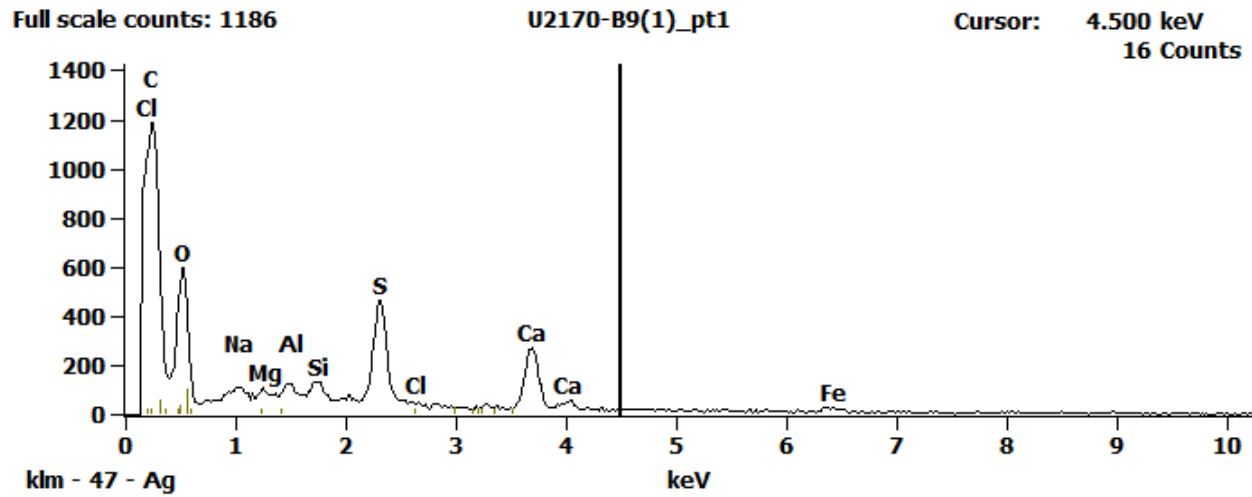


Figure 1. EDS spectra for sample U2170-B9 taken at test area 1. The test area is labeled in the particle SEM photo.

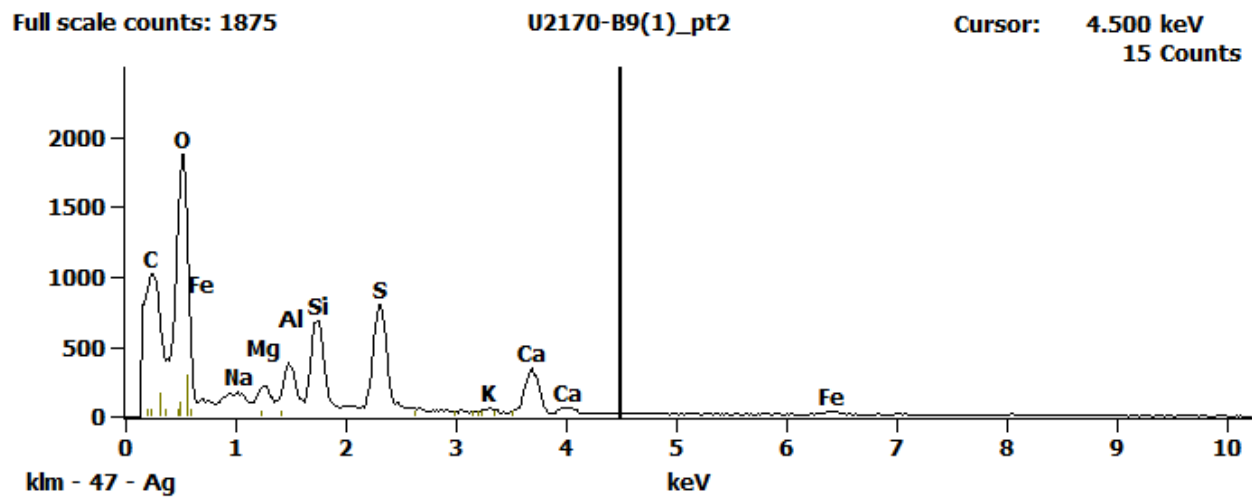


Figure 2. EDS spectra for sample U2170-B9 taken at test area 2. The test area is labeled in the particle SEM photo.

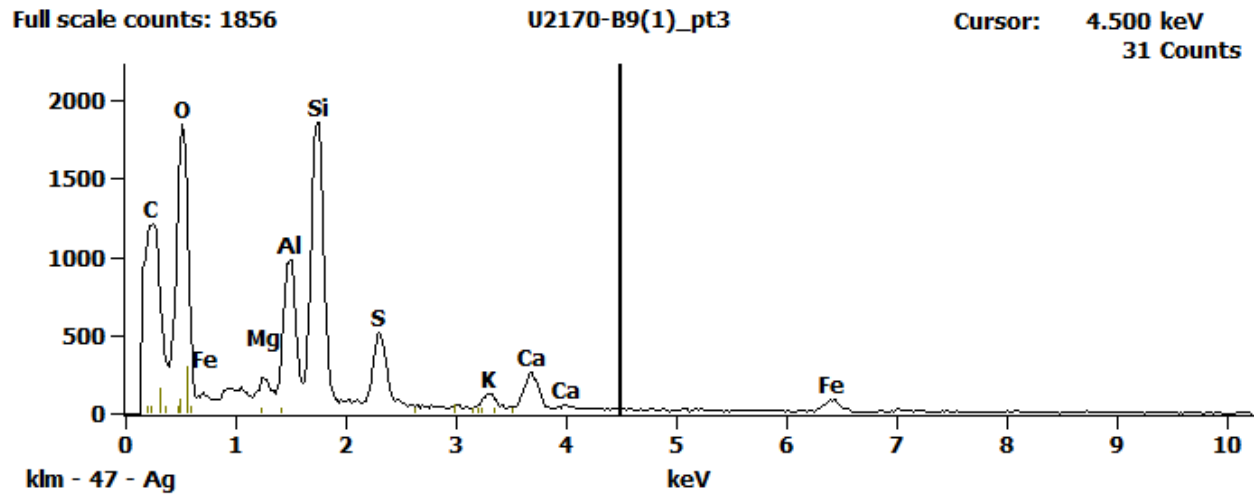
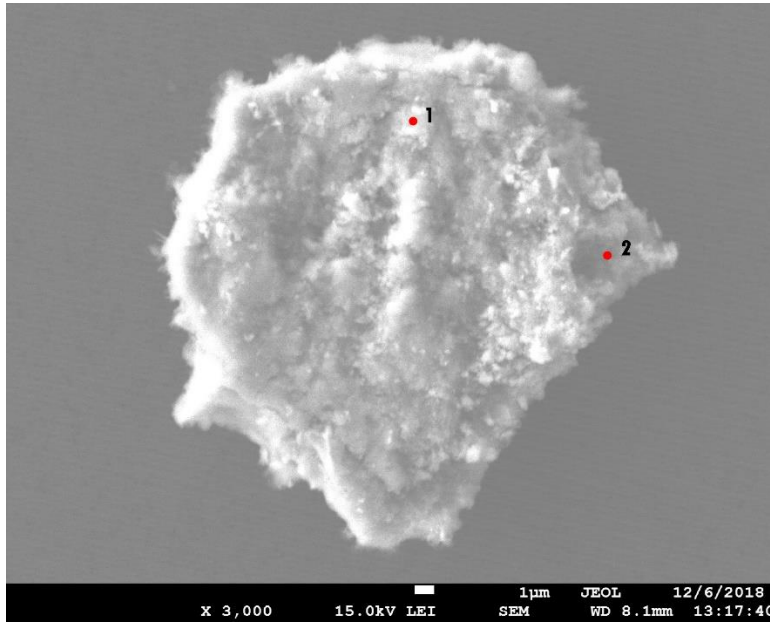


Figure 3. EDS spectra for sample U2170-B9 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 A2



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

SEM photo of sample U2172-A2 with labeled EDS testing locations.

U2172 A2 - EDS Spectra

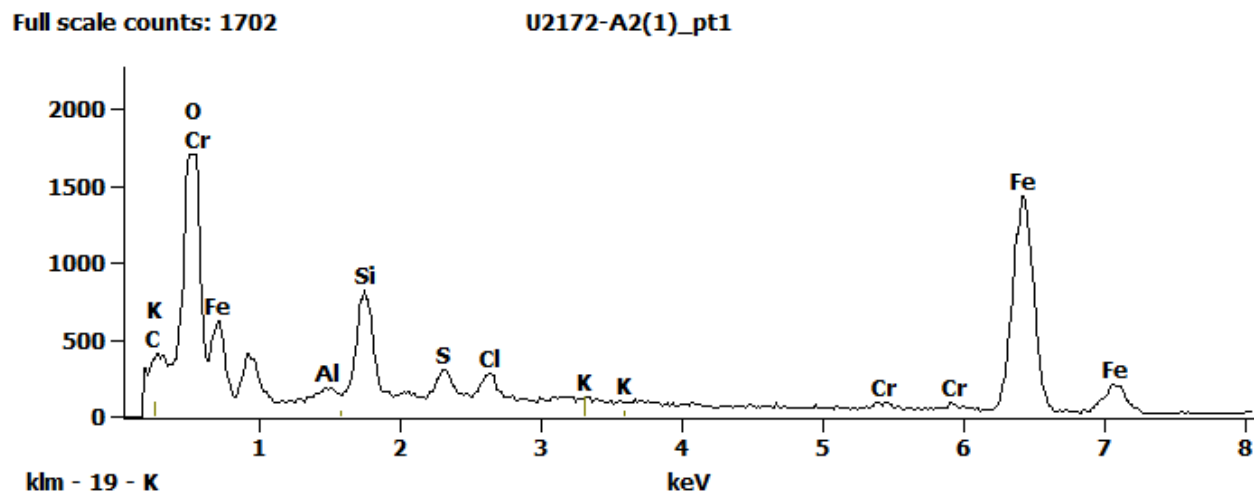


Figure 1. EDS spectra for sample U2172-A2 taken at test area 1. The test area is labeled in the particle SEM photo.

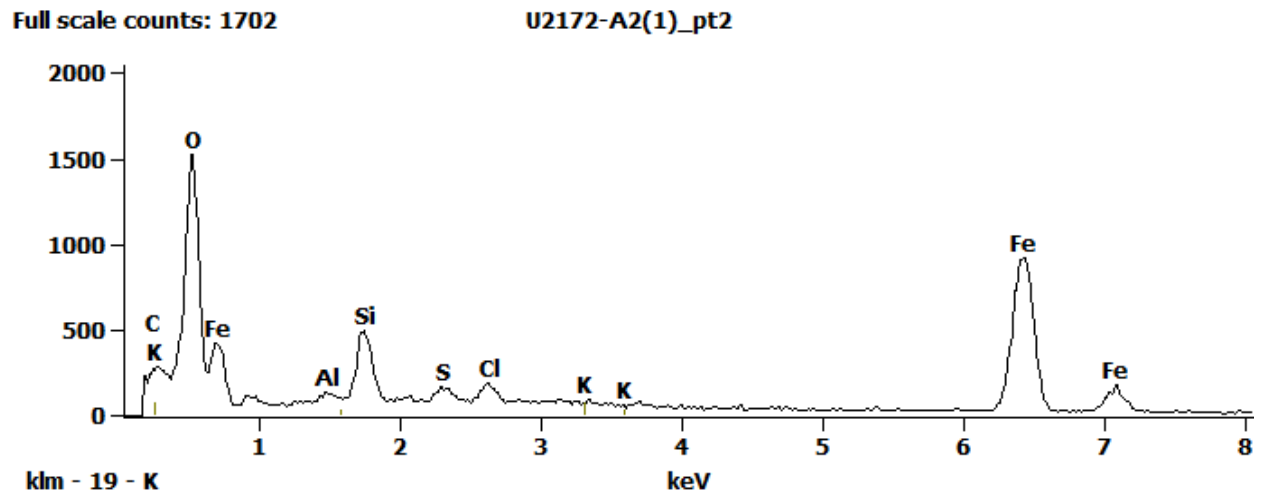
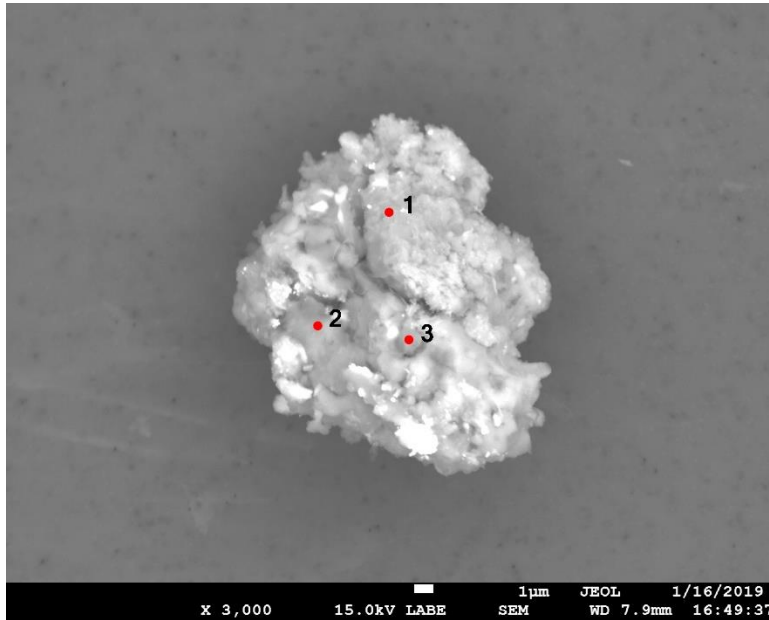


Figure 2. EDS spectra for sample U2172-A2 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 B16



Particle Size:	22 µm
Shape:	Equidimensional to Irregular
Transparency:	Opaque
Color:	BLACK
Luster:	Dull
Particle Type:	POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-B16 with labeled EDS testing locations.

U2172 B16 - EDS Spectra

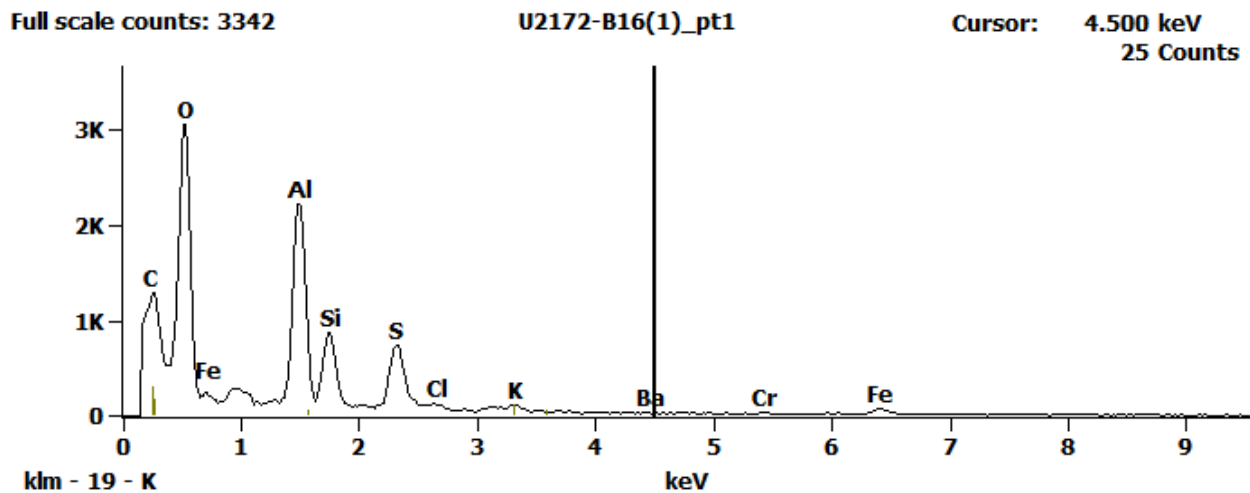


Figure 1. EDS spectra for sample U2172-B16 taken at test area 1. The test area is labeled in the particle SEM photo.

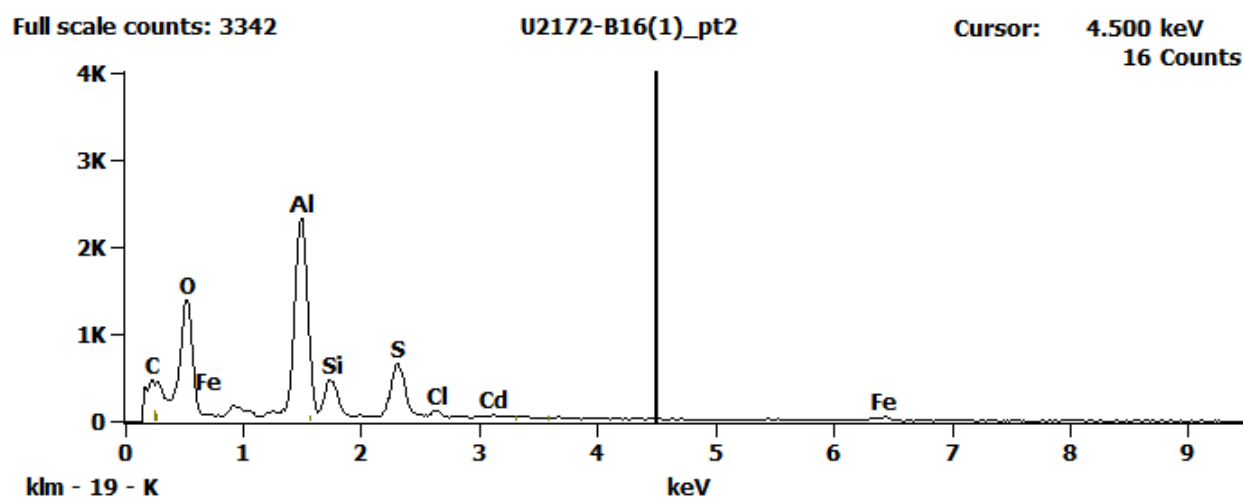


Figure 2. EDS spectra for sample U2172-B16 taken at test area 2. The test area is labeled in the particle SEM photo.

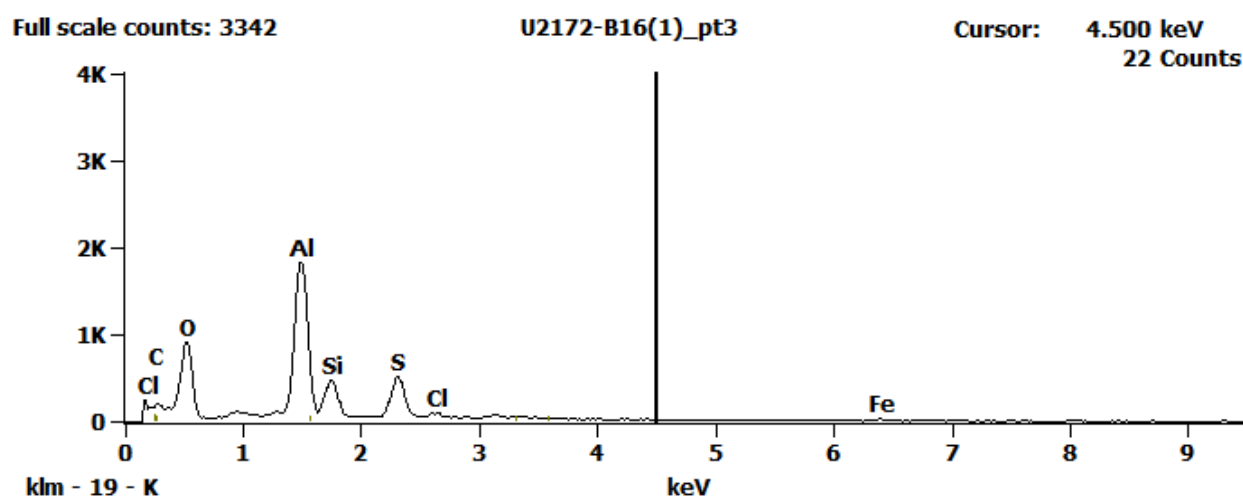
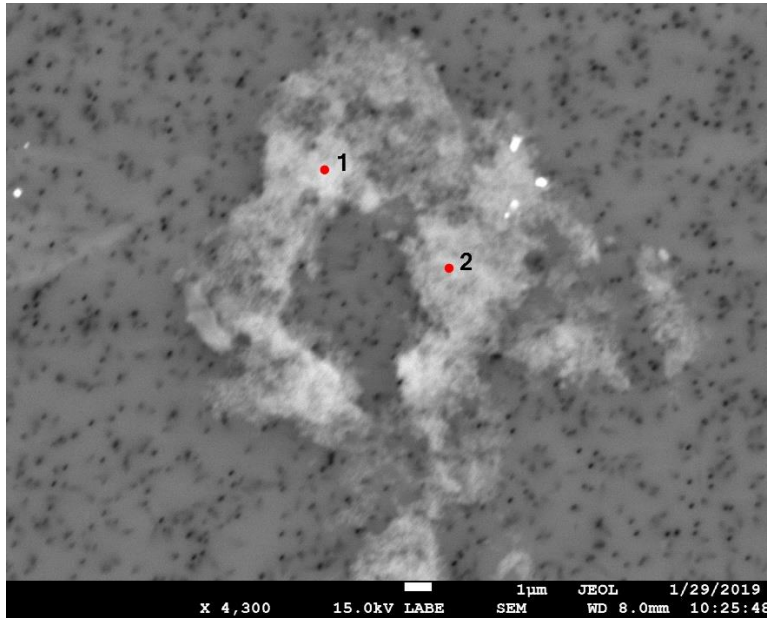


Figure 3. EDS spectra for sample U2172-B16 taken at test area 3. The test area is labeled in the particle SEM photo.

U2172 D8



SEM photo of sample U2172-D8 with labeled EDS testing locations.

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

U2172 D8 - EDS Spectra

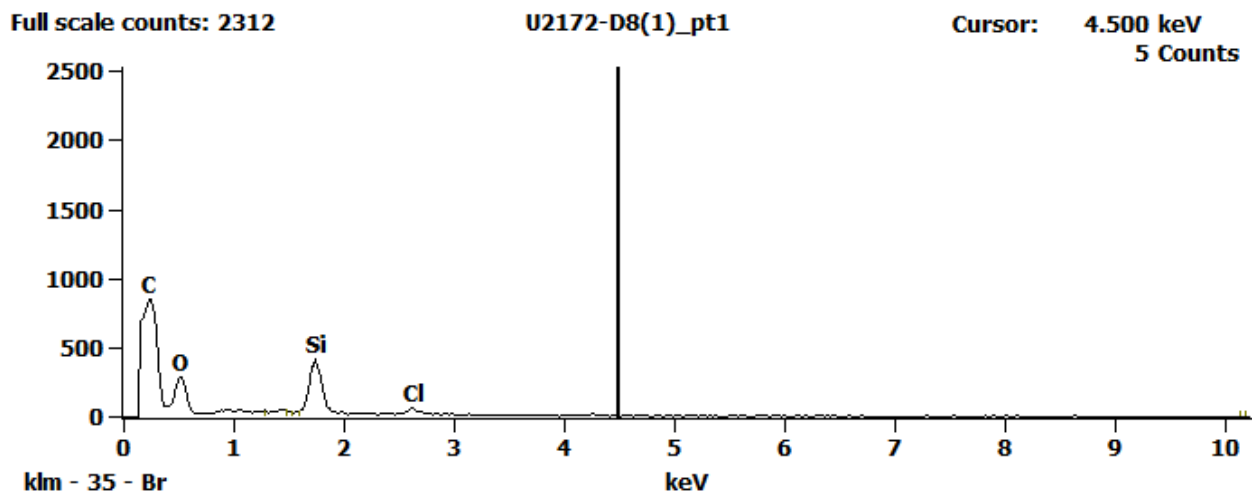


Figure 1. EDS spectra for sample U2172-D8 taken at test area 1. The test area is labeled in the particle SEM photo.

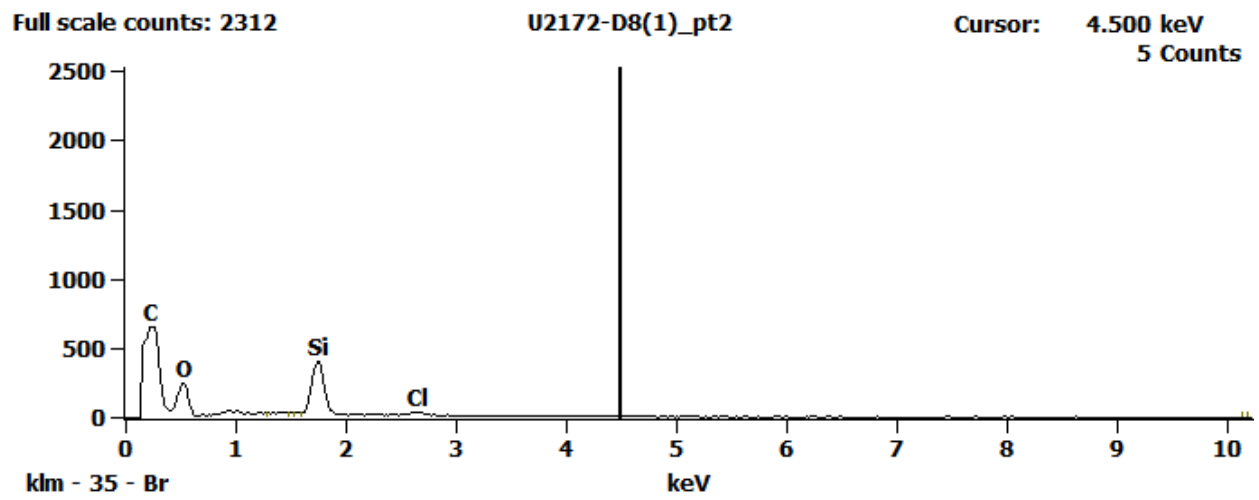
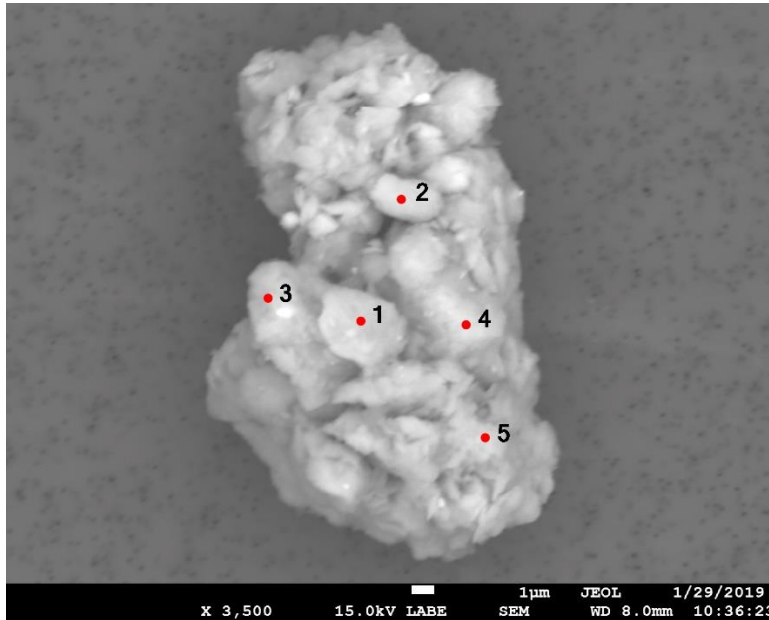


Figure 2. EDS spectra for sample U2172-D8 taken at test area 2. The test area is labeled in the particle SEM photo.

U2172 D10



Particle Size:	13x23 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BLACK, GRAY
Luster:	Dull
Particle Type:	POSSIBLY NATURAL TERRESTRIAL CONTAMINATION
Cluster No.:	
Comments:	

SEM photo of sample U2172-D10 with labeled EDS testing locations.

U2172 D10 - EDS Spectra

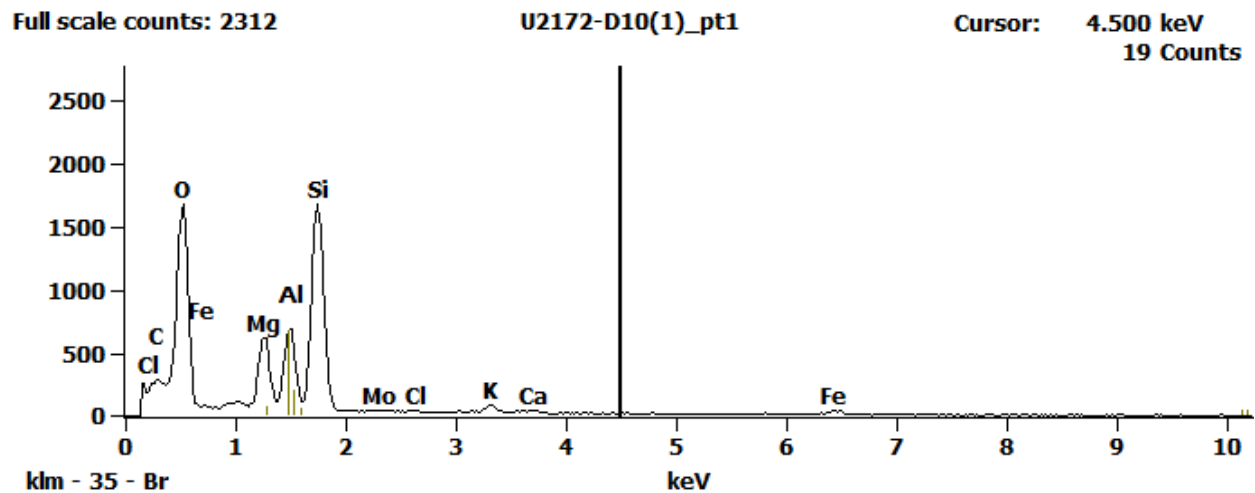


Figure 1. EDS spectra for sample U2172-D10 taken at test area 1. The test area is labeled in the particle SEM photo.

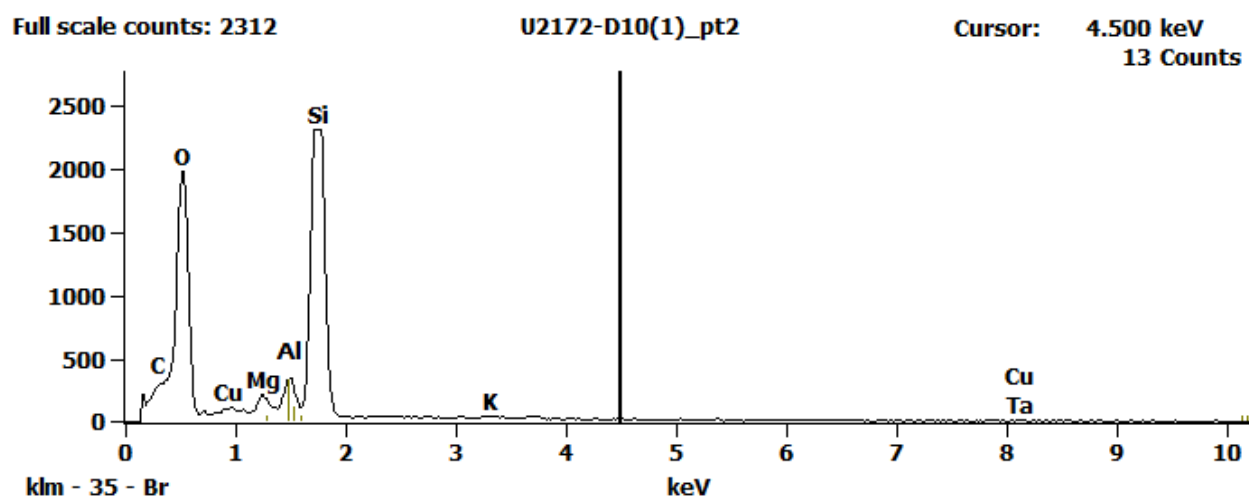


Figure 2. EDS spectra for sample U2172-D10 taken at test area 2. The test area is labeled in the particle SEM photo.

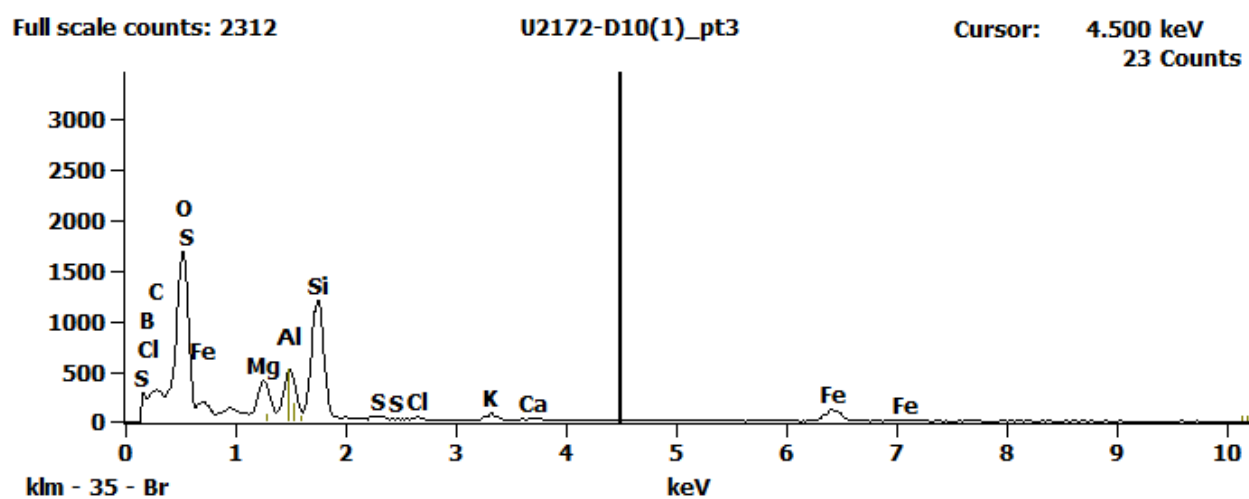


Figure 3. EDS spectra for sample U2172-D10 taken at test area 3. The test area is labeled in the particle SEM photo.

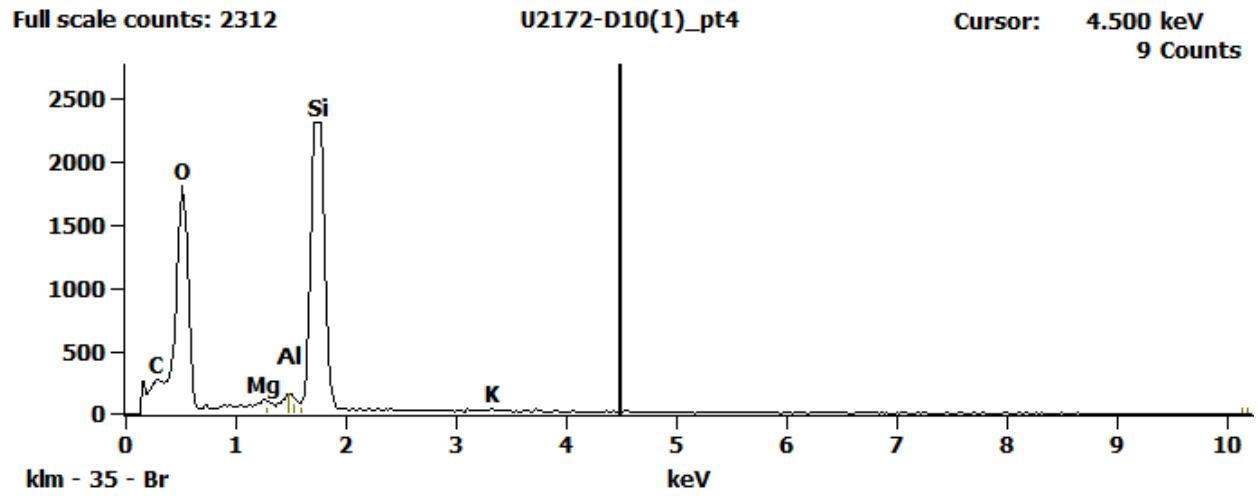


Figure 4. EDS spectra for sample U2172-D10 taken at test area 4. The test area is labeled in the particle SEM photo.

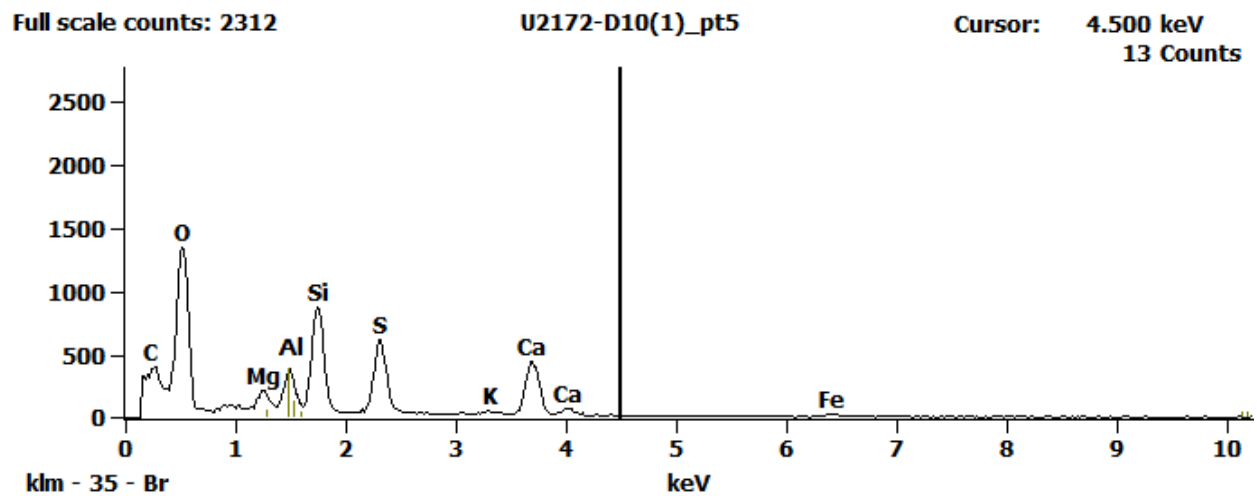
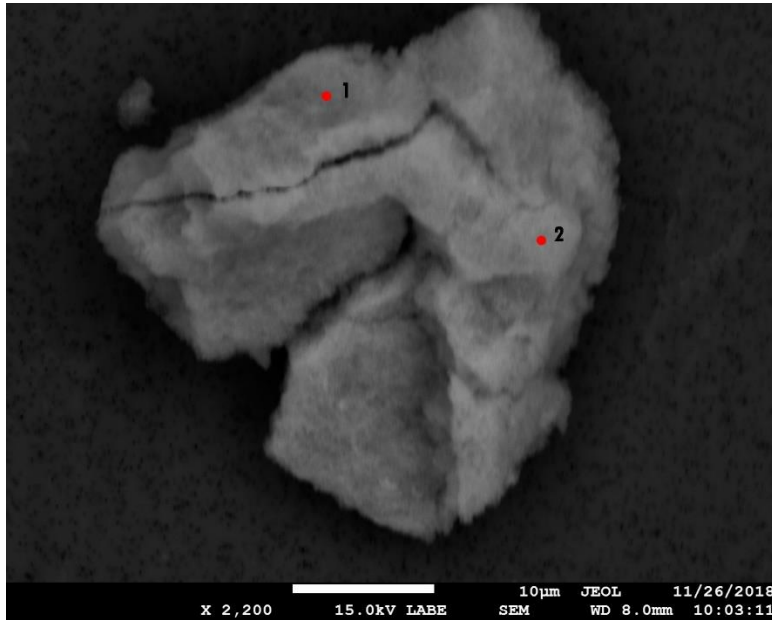


Figure 5. EDS spectra for sample U2172-D10 taken at test area 5. The test area is labeled in the particle SEM photo.

Particle Descriptions

**Aluminum Oxide Sphere and Possibly Aluminum Oxide Sphere
(AOS and AOS ? Types)**

W7016 A5



Particle Size:	35 µm
Shape:	Irregular
Transparency:	Opaque
Color:	BROWN, GRAY
Luster:	Dull
Particle Type:	POSSIBLY ALUMINUM OXIDE SPHERE
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-5 with labeled EDS testing locations.

W7016 A5 - EDS Spectra

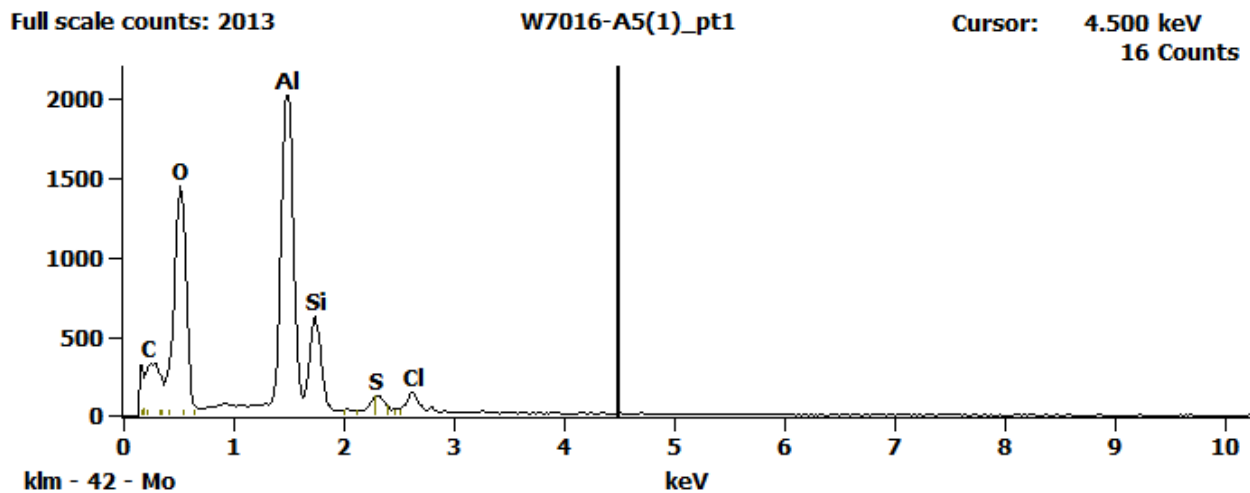


Figure 1. EDS spectra for sample W7016-A-5 taken at test area 1. The test area is labeled in the particle SEM photo.

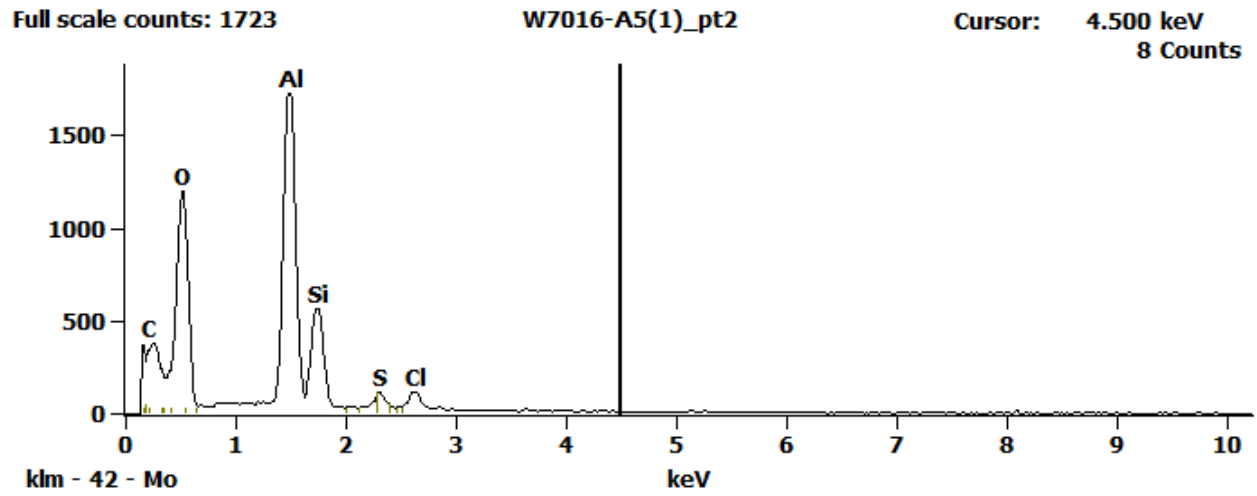
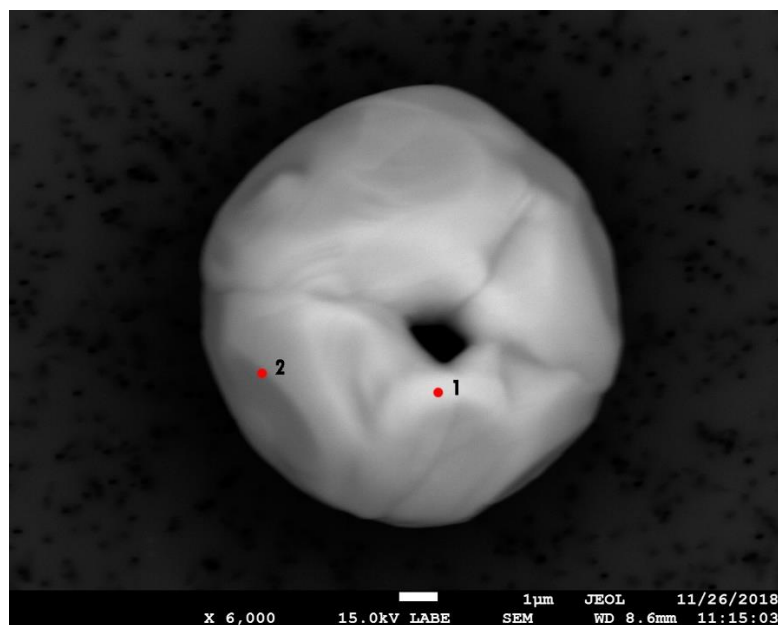


Figure 2. EDS spectra for sample W7016-A-5 taken at test area 2. The test area is labeled in the particle SEM photo.

W7016 A7



Particle Size:	18 µm
Shape:	Spherical
Transparency:	Opaque to Translucent
Color:	CLEAR, GRAY
Luster:	Pearly to Subvitreous
Particle Type:	ALUMINUM OXIDE SPHERE
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-7 with labeled EDS testing locations.

W7016 A7 - EDS Spectra

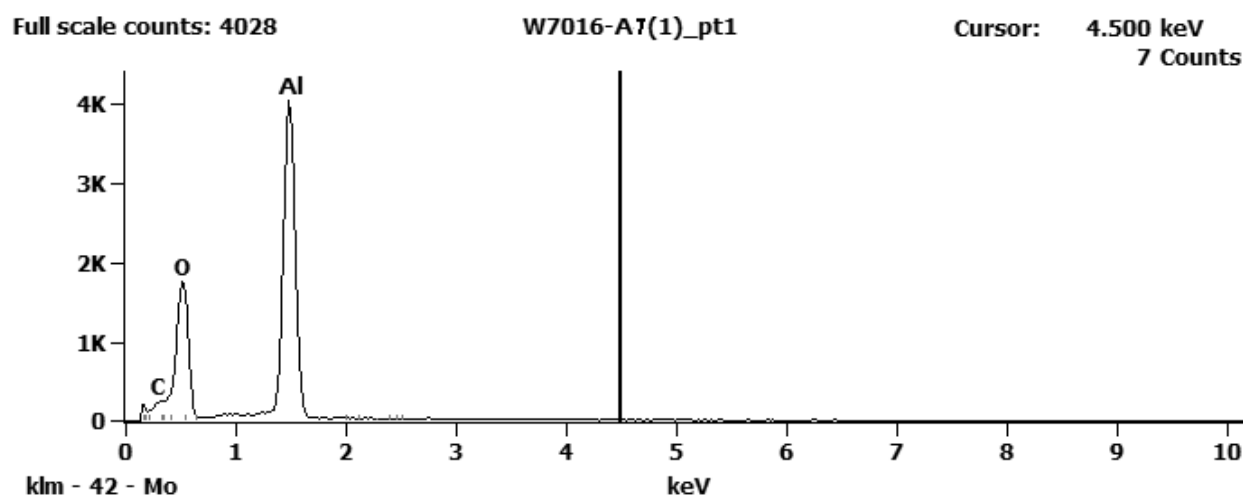


Figure 1. EDS spectra for sample W7016-A-7 taken at test area 1. The test area is labeled in the particle SEM photo.

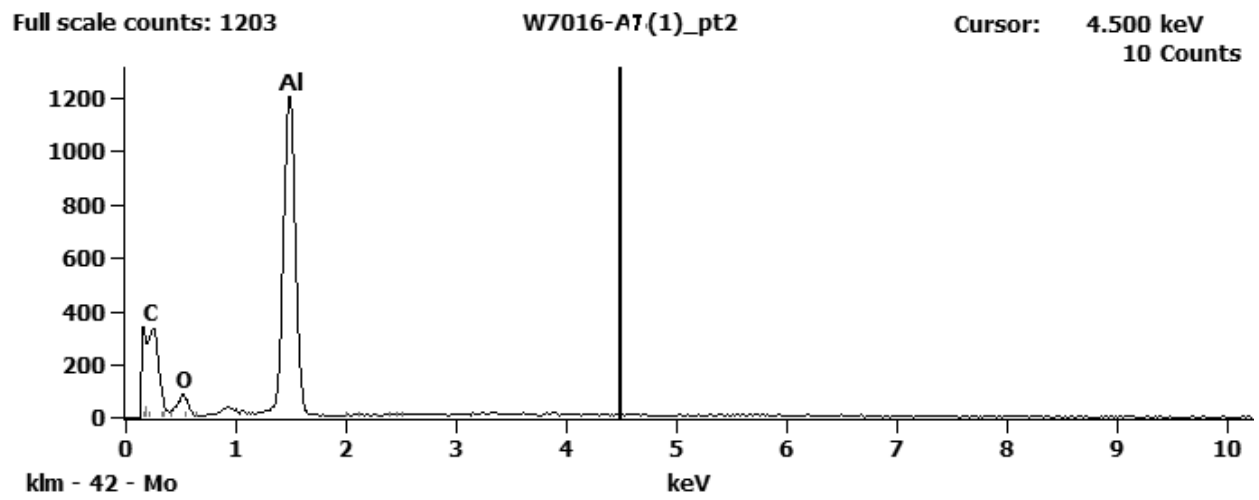
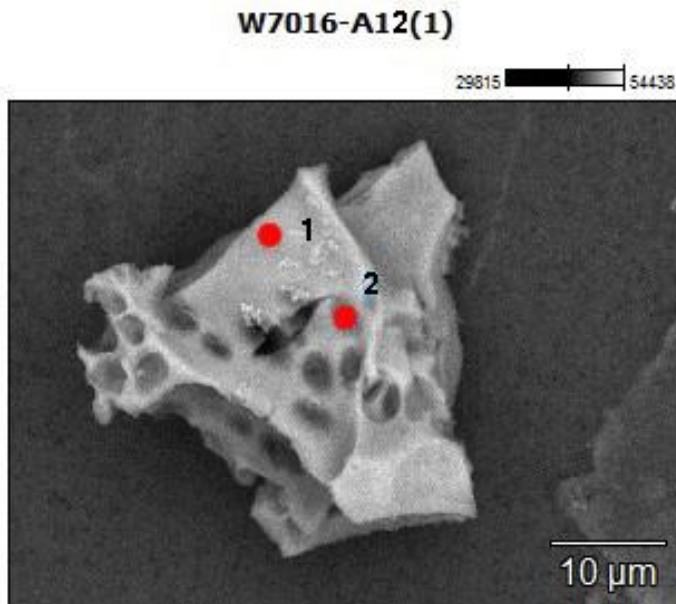


Figure 2. EDS spectra for sample W7016-A-7 taken at test area 2. The test area is labeled in the particle SEM photo.

W7016 A12



Particle Size:	56 μm
Shape:	Irregular
Transparency:	Opaque
Color:	BROWN
Luster:	Dull
Particle Type:	POSSIBLY ALUMINUM OXIDE SPHERE
Cluster No.:	
Comments:	

SEM photo of sample W7016-A-12 with labeled EDS testing locations.

W7016 A12 - EDS Spectra

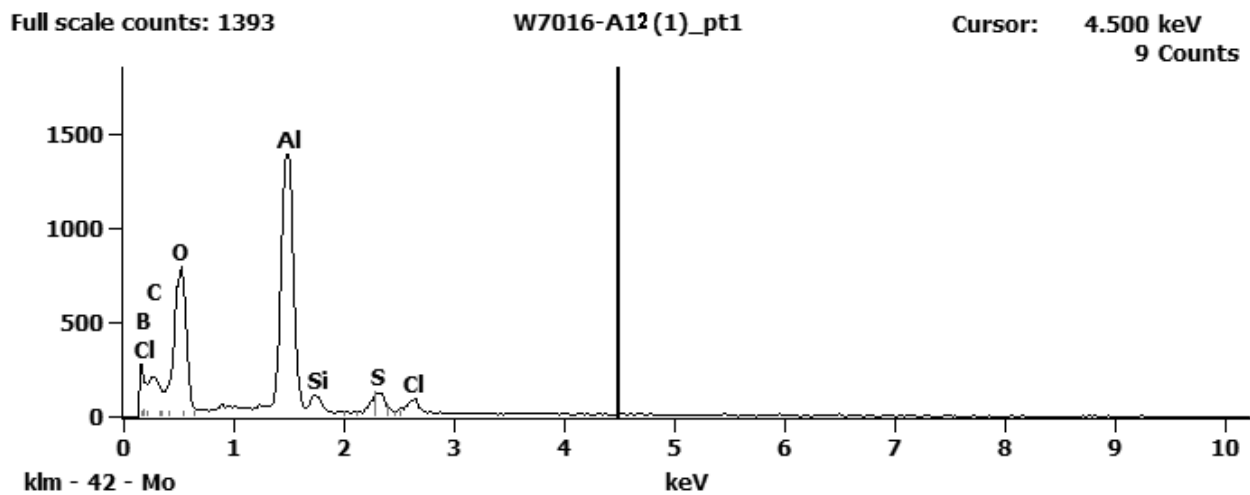


Figure 1. EDS spectra for sample W7016-A-12 taken at test area 1. The test area is labeled in the particle SEM photo.

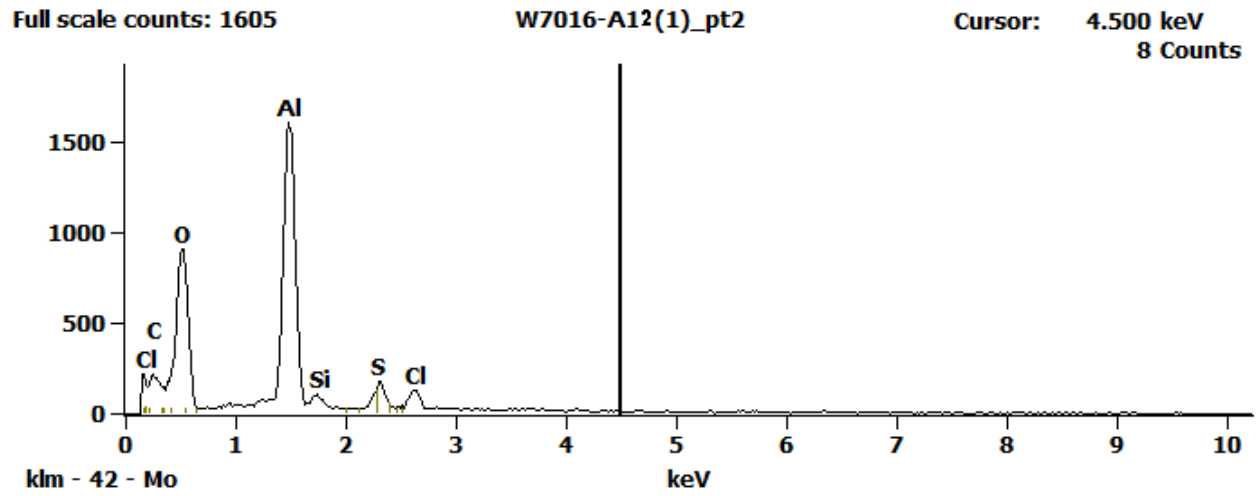


Figure 2. EDS spectra for sample W7016-A-12 taken at test area 2. The test area is labeled in the particle SEM photo.