Frontier Analysis, Ltd

TECHNICAL SERVICE RESPONSE NO.: UT050

Subject: Analysis of a Metal Chunk Purportedly from a UFO (1995)

Date: April 14, 2007 **Requested By:** Joe Stets

Reported By: P. A. Budinger
Analytical Scientist

Background/Objective:

In 1995 a chunk of metal fell from an unknown “craft” flying overhead. The bizarre event as described by the chief investigator, Joe Stets, follows.[1]

> “The event happened in the summer of 1995 about 40 miles east of Columbus in Hopewell, Ohio. The witness was going out to get the mail when he heard what sounded like metal grinding on metal. He looked around but didn't see anything. Still hearing the sounds he looked up and sighted "a craft". This craft was “primitive looking". Very squarish and silent. He estimated it to be 300' long with a "wing of 100'. It had a canard wing in front with a span of 50'. It was slightly South of his position. The "wing " being the closest to him.
>
> It was traveling East to West at an altitude "so low I could have hit it with a rock". There were no structures on the surface. No aerodynamic shape. A very box like shape. No windows or other indication of viewing areas.
>
> As he watched he heard something hit the ground near him. He didn't see anything released from "the craft". He didn't see any trace of smoke or trouble with the craft. He didn't see the object hit the ground. He was standing on the South side of a ridge of hills on a driveway leading to the family home. Hidden Spring Road is on the North side of the ridge and runs West to East. This is in the same area as Flint Ridge State Park. The driveway runs from the road due South over the top of the ridge turning South South East to the home.

[1] Joe Stets, Personal Communication, Email, 24 May 2006.

> The witness stated he had to look around the area to find the specimen. It was sitting off the road in a dirt area that was very moist. The sample was misplaced until recently."

The objective is to examine the sample using infrared spectroscopy[2], XRD [3] (X-ray Diffraction) for crystalline material, and EDS[4] (Energy Dispersive X-ray Spectroscopy) elemental analysis, to determine the composition of the metal fragment. A photograph of the metal chunk taken by Joe Stets follows:

Conclusions:

•The analysis shows the sample is an aluminum alloy with a density of ca. 2.8±0.5 g/cc. This value falls into the range for aluminum alloys (2.7 g/cc).[5] It is a high purity alloy with only silicon detected. The aluminum is covered with environmental debris, such as mineral silicates and carbonates, which are

[2] Infrared spectroscopy is used for molecular structure identification and quantification of solids, liquids and gases. An infrared spectrum is the result of light (in the 2 to 25 micron wavelength range) interacting with the vibrations of molecules. The particular set of vibrations of a molecule gives rise to specific spectral absorption bands, often referred to as the "fingerprint" spectrum. It should be noted that infrared analysis is used for molecular determination of substances and does not reveal information regarding metal alloys or its elements.

[3] X-ray Powder Diffraction is used for the identification and quantification of ***crystalline*** phases in solids and slurries. A diffraction pattern is obtained from a material by the interaction of very short wavelength light (X-rays) with the planes of atoms found in materials with long range order (crystalline matter). Constructive interference in three dimensions gives rise to the maxima found in diffractograms. Qualitative identifications can be made by computer matching the observed pattern with reference patterns in a database.

[4] X-ray fluorescence identifies elements and their semiquantitative amounts. Samples are stimulated with X-rays that cause them to emit X-ray fluorescence radiation. This emitted radiation is resolved into a spectrum characteristic of each element.

[5] MatWeb, The online Materials Database, Aluminum Alloys, General, http://www.matweb.com/search/SpecificMaterialPrint.asp?bassnum=MA0001.

common components found in dirt. Oxidation of the aluminum on the outer surface is suggested.

•The high purity of the aluminum alloy shows it is not an industrial grade. It should also be added that this is not an unknown alloy. The metal can be categorized as a wrought 4000 type alloy because silicon is the only other element detected.[6,7] The grades in the 4000 series are commonly used for welding wire and as cladding alloys for brazing sheet.[8]

• The alloy could possibly have resulted from a broken weld in a conventional aircraft suffering a mechanical problem. Wrought alloys of a 4000 type are used for welding in the aircraft industry. [9] If not, its source remains unknown.

•No radiation above background was detected from the metal.

Comments:

•Joe Stets sent along an EDS elemental analysis accompanied by SEM photographs done by another laboratory. The results do not indicate which portion of the metal was examined (outer or cut surface). However, the results of the test runs are similar to those of the EDS analysis by the Technology of Materials laboratory. (See page 4.) We speculate that the reported minimum amounts of Mg and Si found in one test are from the outer surface. These would represent silicate minerals from dirt. Another test shows predominant amounts of Al and a small amount of Si, which probably represent the cut surface inner alloy material.

Other tests, which normally would be recommended, for purported other-worldly metal samples would be isotopic analysis and possibly examination of the samples for trace elements. The isotopic analysis is not recommended for this sample because it is aluminum, and this element only has one isotope[10]. It

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[6] Erik Oberg et al., 26th Edition Machinery's Handbook, Industrial Press Inc. New York, 2000.
[7] MetalForming Magazine, Pressworking Aluminum alloys, Metalforming OnLine http://archive.metalformingmagazine.com/1995/10/alumin/aluminum.htm.
[8] Aluminum Alloys and Welding Data, Online at http://www.welrealty.com/aluminum alloys.htm.
[9] Ron Alexander & Scott Hetzer, EAA Sport Aviation, Nuts and Bolts Aircraft Building – Welding Aluminum, September 2004, Pg 98.
[10] Isotopic (measurements) ratios of the elements can be taken by ICP/MS (Inductively Coupled Plasma/Mass Spectrometry) to see if they differ from terrestrial values. An element is defined by the number of protons in its nucleus. Most elements have two or more isotopic forms. That is, the element may have more or less neutrons. Each neutron has a weight of one. So an isotope with more neutrons weighs more than an isotope with less. The ratios of isotopes for any given element on earth will always be the same, i.e. it's a constant. The theory is that these isotopic ratios might be a result of the elements formation in the earliest phase of our solar system, i.e. they are unique to this system. It is thought that these ratios might vary in other solar systems because the elemental formations may have been different. So, if we find the ratios are not normal as compared to terrestrial elements, then the sample may have an extraterrestrial origin.

would be possible to examine the aluminum for trace metals[11]. But someone would have to be found who is familiar with the variances in trace metals in aluminum. This test may also be quite expensive.

Procedure:

The sample was received by this laboratory on March 27, 2006. It weighed 6.5167 grams. Following are photographs of the received sample. These appear to be an end specimen of the sample shown in the photograph on page two.


Side 1


Side 2


Cut Side

Infrared spectra were taken of both sides of the sample and the cut side using the Harrick SplitPea™ accessory on the Nicolet Avatar 360 spectrometer. A rough density estimation was made by determining how much water the 6.5167 g sample displaced.

The sample was sent to Technology of Materials in Wildomer, CA for EDS (Energy Dispersion Spectroscopy) elemental analysis and XRD (X-ray Diffraction) analysis for crystalline material. It was requested that data be obtained from the outer surface material and from the shiny cut side.

Photographs were obtained using a digital camera. Radioactivity measurements were made with a SE International Radiation Alert® Monitor 5.

Results:

The results of the individual tests done on the sample follow. These results are summarized in the conclusions section on the pages two and three of this report.

EDS and XRD Analyses

The complete report of the EDS and XRD analyses by Technology of Materials, Wildomar, CA, can be found in the Appendix of this report. In summary, EDS

[11] Examination of trace elements in the sample by ICP might indicate an unusual array not seen before.

elemental analysis of the outer surface material shows it contains a predominant amount of Al, followed by minor amounts of Si, Mg and a small amount of Ca. Si, Mg and Ca are typical elements from minerals found in 'dirt'. The XRD analysis supports this by showing characteristic dirt minerals such as calcite ($CaCO_3$), quartz and feldspar. Some $Al(OH)_3$ is detected and probably results from the metallic aluminum oxidation. This analysis supports the infrared analysis discussed below.

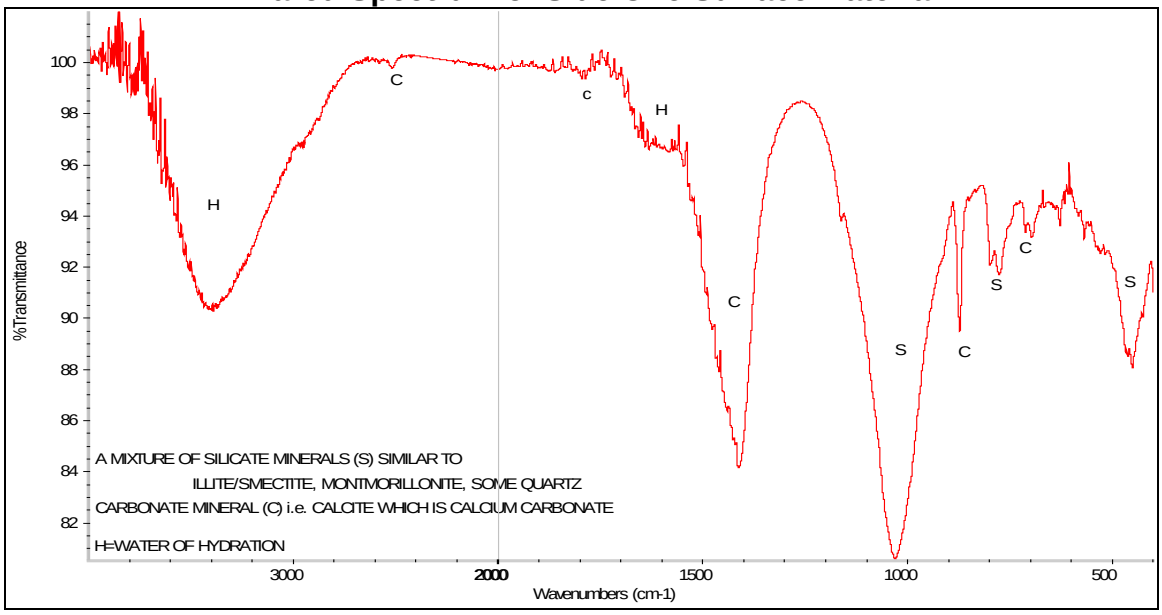
These analyses were also done on the interior metal. EDS elemental analysis shows dominant amounts of metallic Al, followed by small amounts of silicon. XRD confirms this fining and shows aluminum and silicon are present in their metallic form.

Infrared Analysis

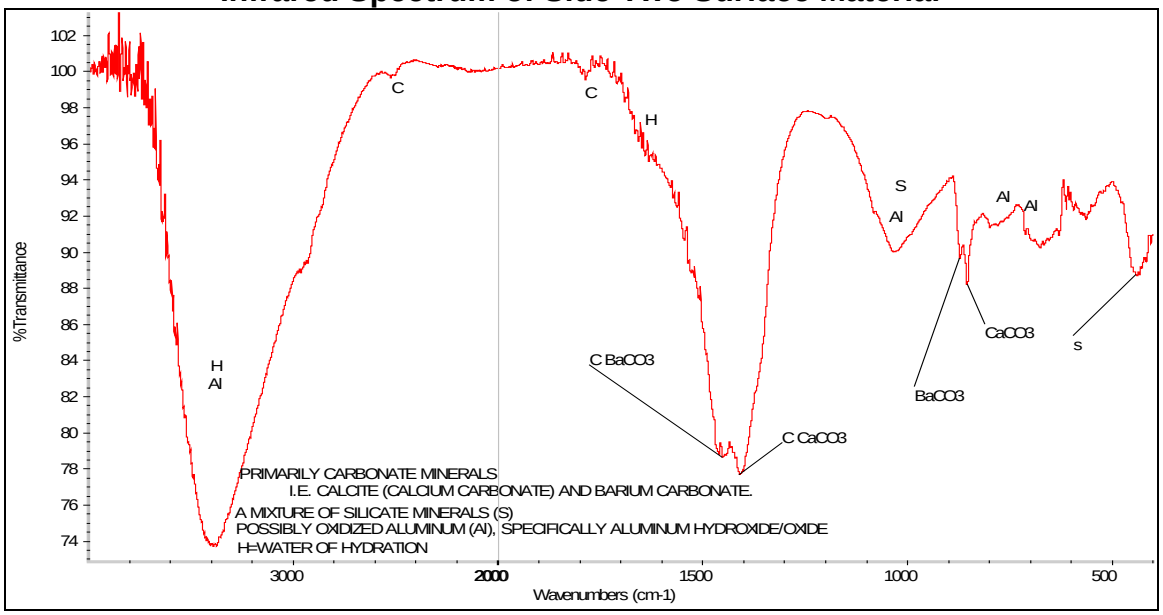
Infrared analysis of the outside surfaces of the metal chunk shows it is coated with a mixture of common minerals (dirt) such as an assortment of silicates, which are most similar to illite/smectite, montmorillonite and possibly some quartz. In addition, there are carbonate minerals which are identified as calcite (calcium carbonate) and barium carbonate. Some of the surface metal appears to be oxidized.

The spectra follow with pertinent peaks labeled. The appendix contains mineral references for comparison.

Infrared Spectrum of Side One Surface Material

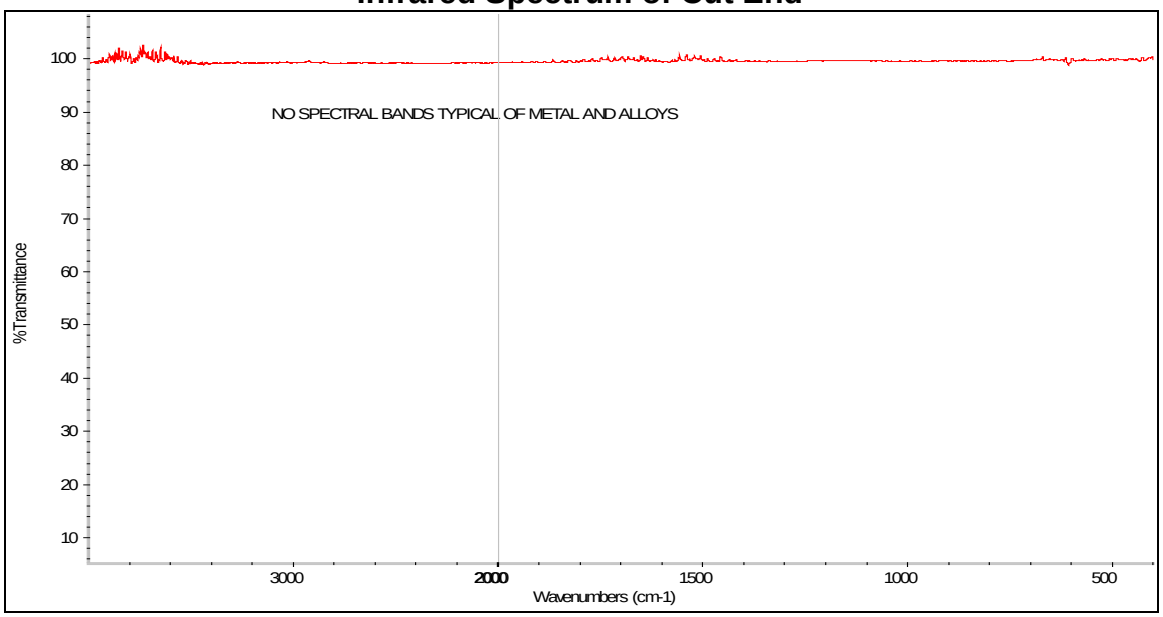


Infrared Spectrum of Side Two Surface Material



The cut section of the sample has no bands in the infrared spectrum. This is typical of metals and alloys. Following is the spectrum.

Infrared Spectrum of Cut End



Other Analyses

A crude density measurement of the sample shows it is roughly 2.8 ± 1 which compares to that of aluminum and its alloys.

No radiation above background was detected.

File: UT050

Copies:
Nick Reiter
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_____
Phyllis A. Budinger

APPENDIX

EDS and XRD Report
Technology of Materials

Infrared References
Illite/Smectite
Montmorillonnite
Quartz
Calcite
Barium Carbonate

TECHNOLOGY OF MATERIALS

21090 Cielo Vista Way
Wildomar, CA 92595

Sam Iyengar Ph.D.
Technical Director

Ms. Phyllis Budinger
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June 14, 2006

Phyllis:
Enclosed please find a report on the characterization of a chunk of metal**.** Please call me if you have any questions or concerns.

Sincerely,

Sam Iyengar

Characterization of a Chunk of Metal Sample

Summary:

A chunk of metal was received at the laboratory for characterization. It was requested that the metal be tested on both polished and unpolished side to determine their composition. It was analyzed by Scanning Electron Microscope attached Energy Dispersive X-ray System (SEM/EDS) and X-ray diffraction (XRD). The following report summarizes the findings:

Introduction:

The following sample was tested:

A chunk of metal with a polished side

Methods:

The polished side was analyzed “as-is”. From the rough side, few particles were scrapped off for analysis. They were then analyzed by X-ray powder diffraction and Scanning Electron Microscopy attached with a windowless energy dispersive x-ray spectrophotometer (SEM/EDS).

X-ray Diffraction (XRD)

Sample was then scanned from 19 to 39 degrees two-theta using Cu K-alpha radiation and a scintillation detector on a Phillips Diffractometer at 30 Kv and 30 ma. The resulting patterns collected on a computer were matched with the reference standards for various inorganic and organic materials stored in the JCPDS database.

Scanning Electron Microscopy /Energy Dispersive X-ray Analysis (SEM/EDS)

In this technique, an electron microscope with an energy dispersive X-ray spectrometer is used for analysis. The electron beam in the microscope causes specimens to emit x-rays including those from the k, l and m atomic shells. Spectrometer counts of these x-rays, which are said to be “characteristic” of the elements present in the specimen, can be used to calculate composition for a full qualitative analysis. The analysis is non-destructive and is accurate to ~ 1 %.

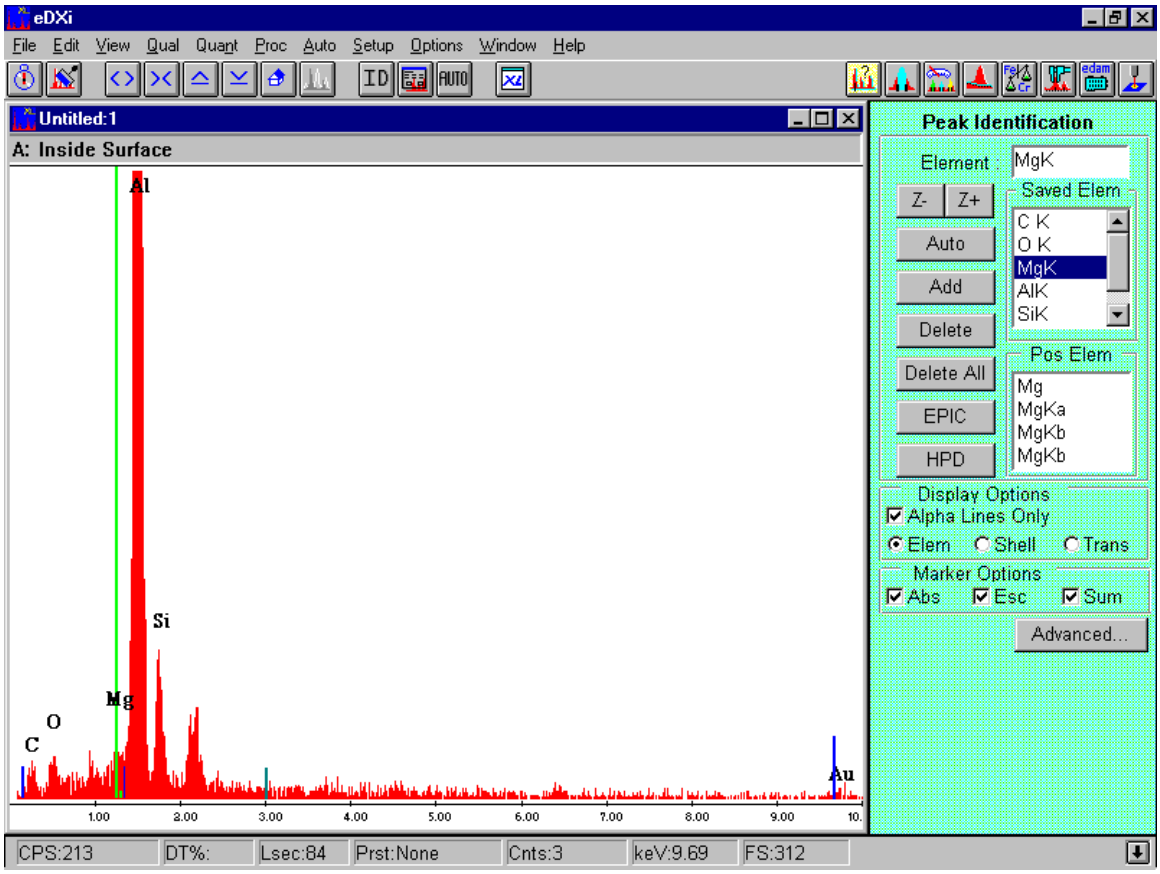
Results and Discussion:

EDS pattern for the polished side of the metal chunk is shown below in Figure 1. This surface contains dominant amounts of metallic **Al**, followed by **small** amounts of **silicon**.

XRD pattern (Figure 2) confirms the above finding. Aluminum and silicon are present in their metallic form.

EDS pattern for the outside surface (Figure 3) shows that it contains predominant amounts of **Al**, followed by **Si, Mg** and **Ca.** Gold (Au) is from the coating applied to make them conductive

XRD analysis (Figure 4) of the powder from outside surface shows that it contains mostly metallic Al and Si. Also present in significant amounts is Al(OH)3 (bayerite) and calcite (CaCO3). There is very small amounts of quartz and feldspar (probably dust)



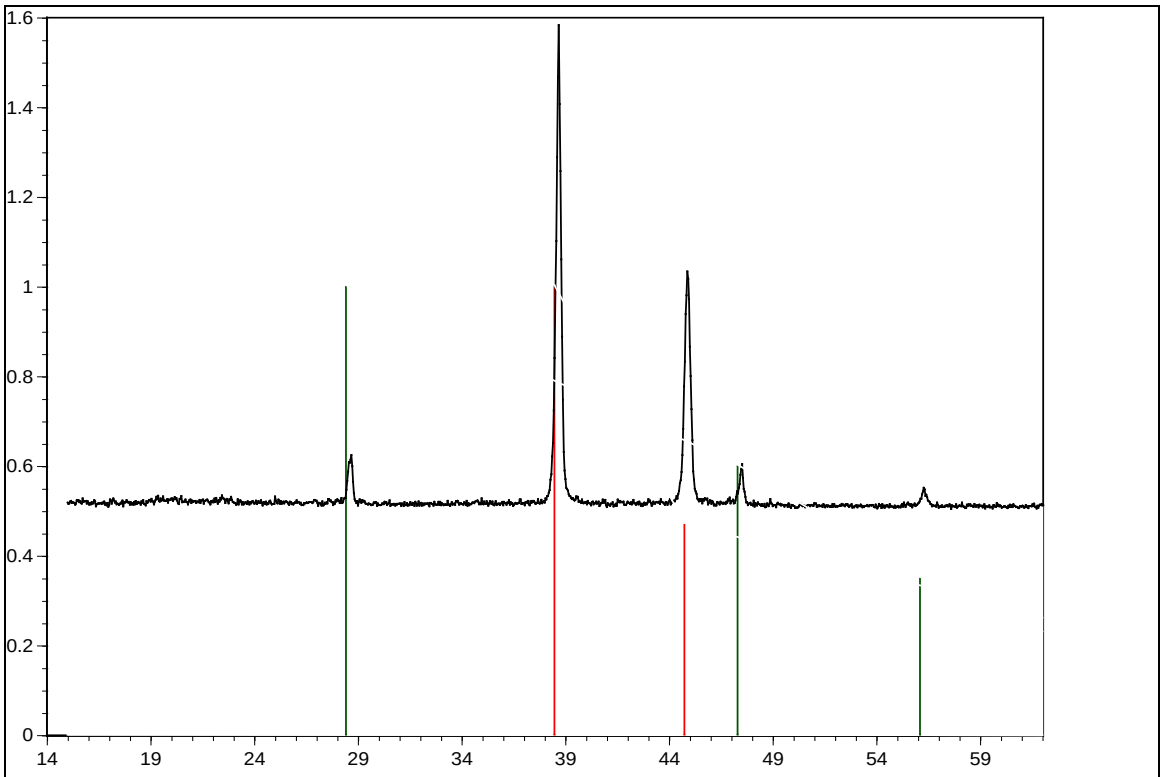
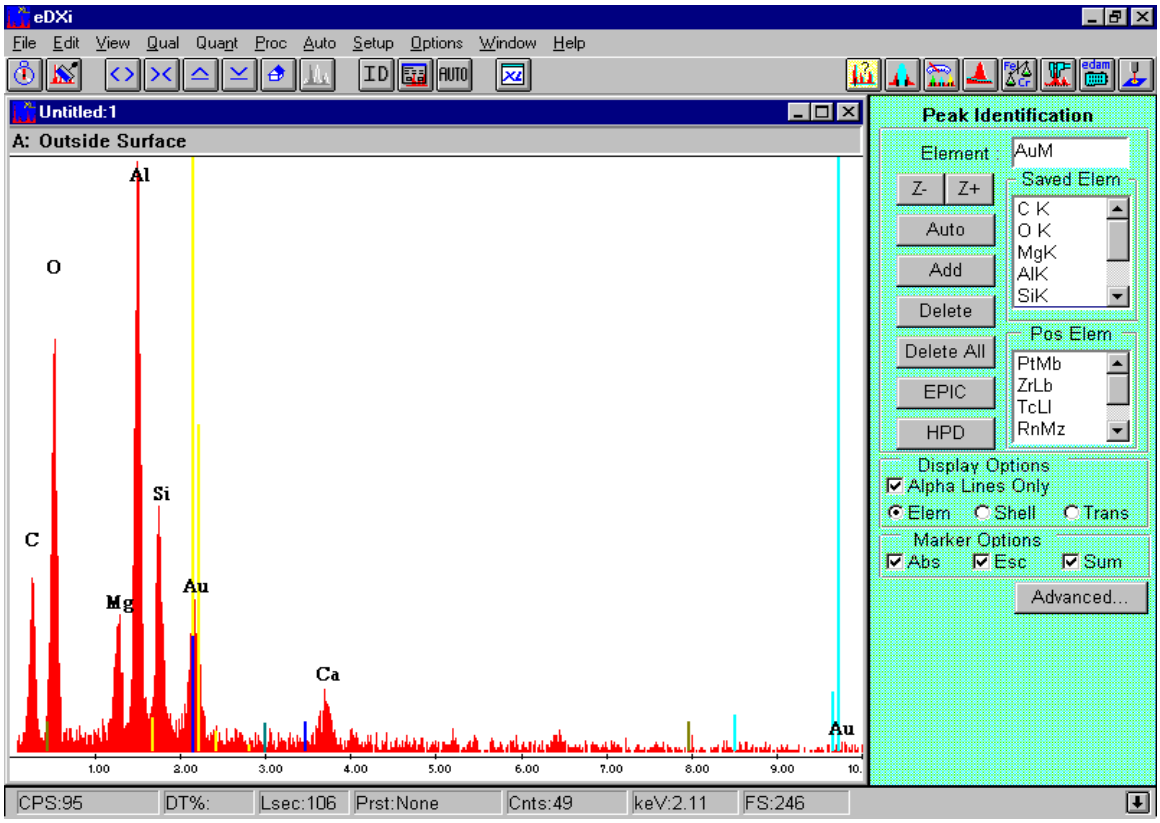


Figure 1: XRD pattern for polished side of the metal chunk with stick patterns for Al (red)) and Si (green)



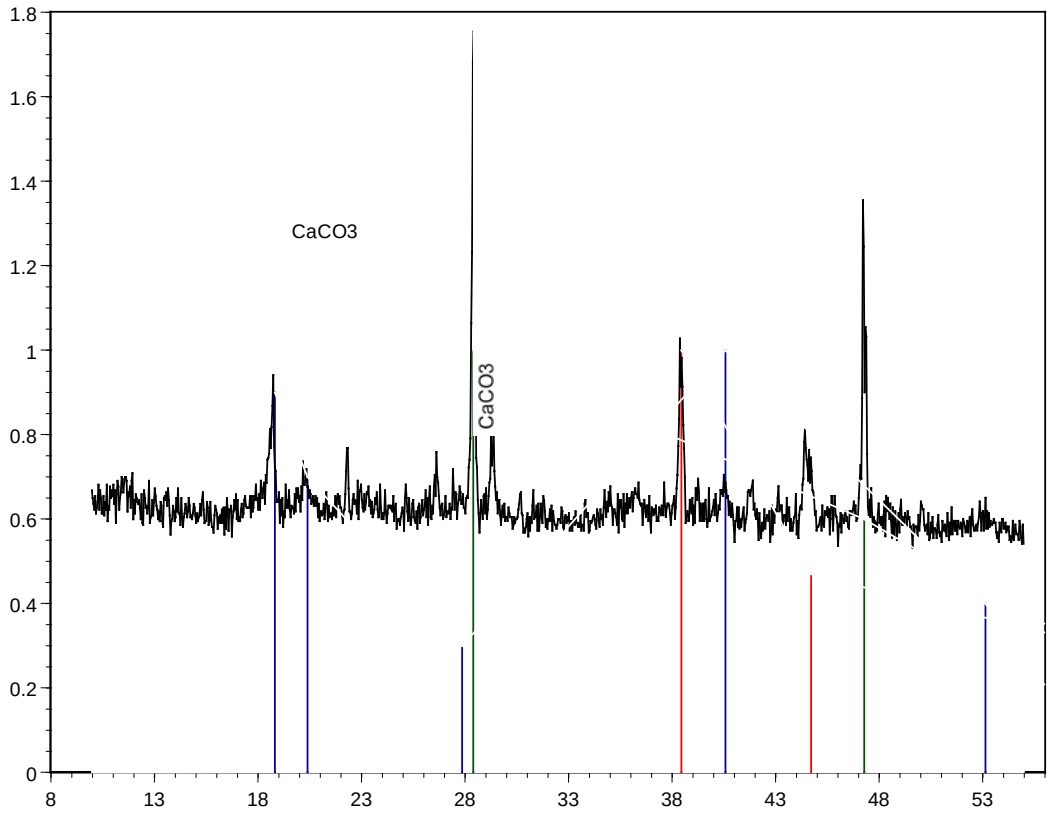
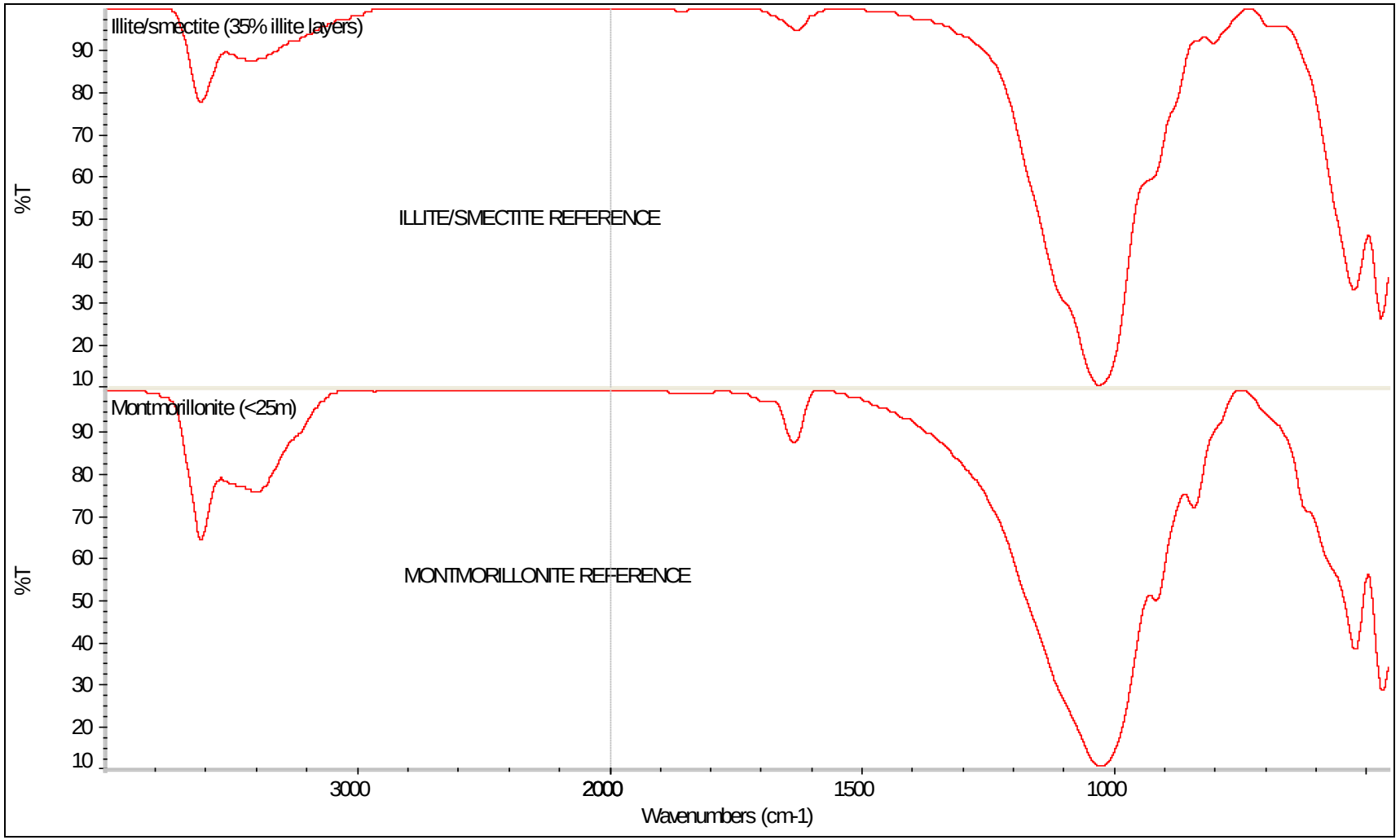
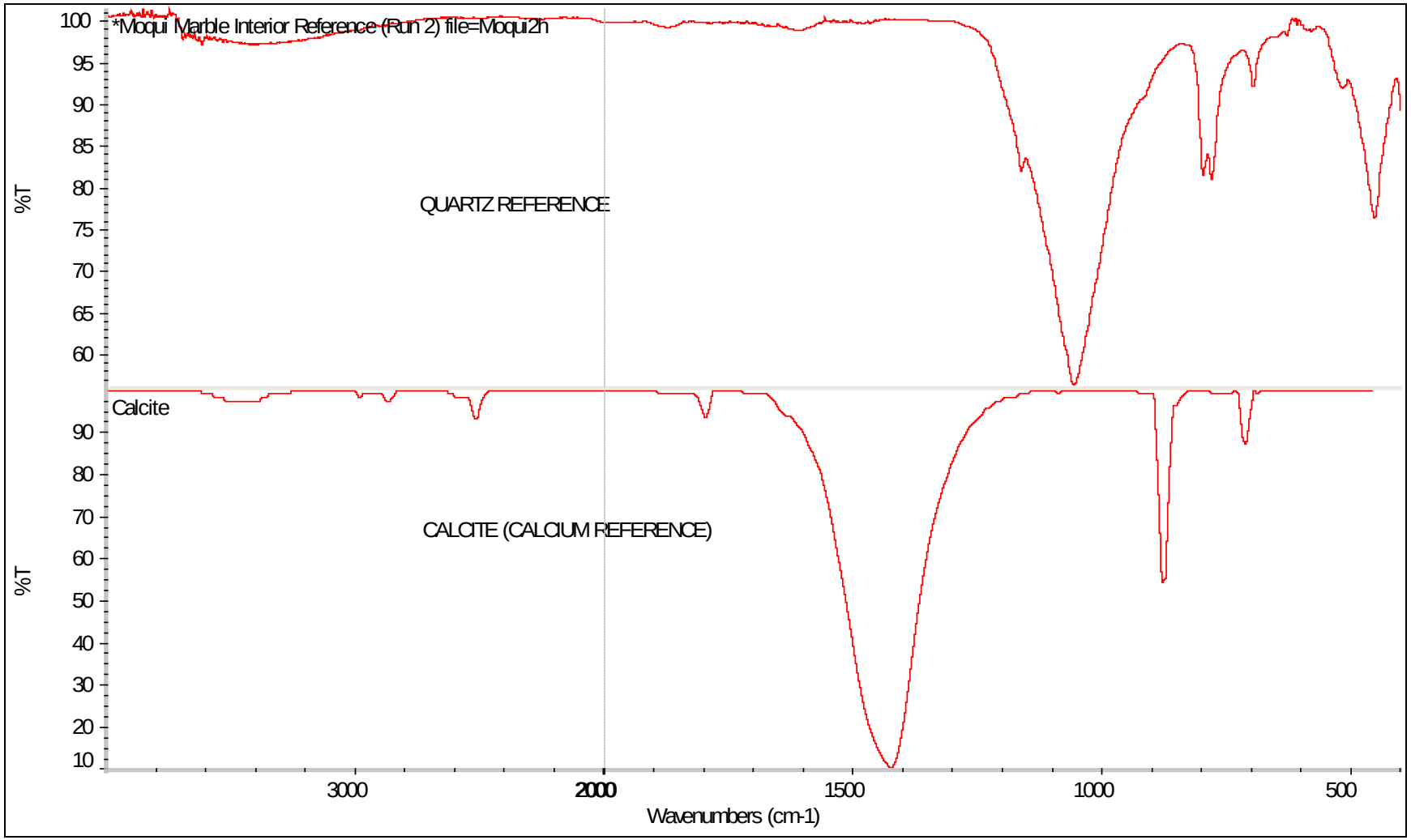


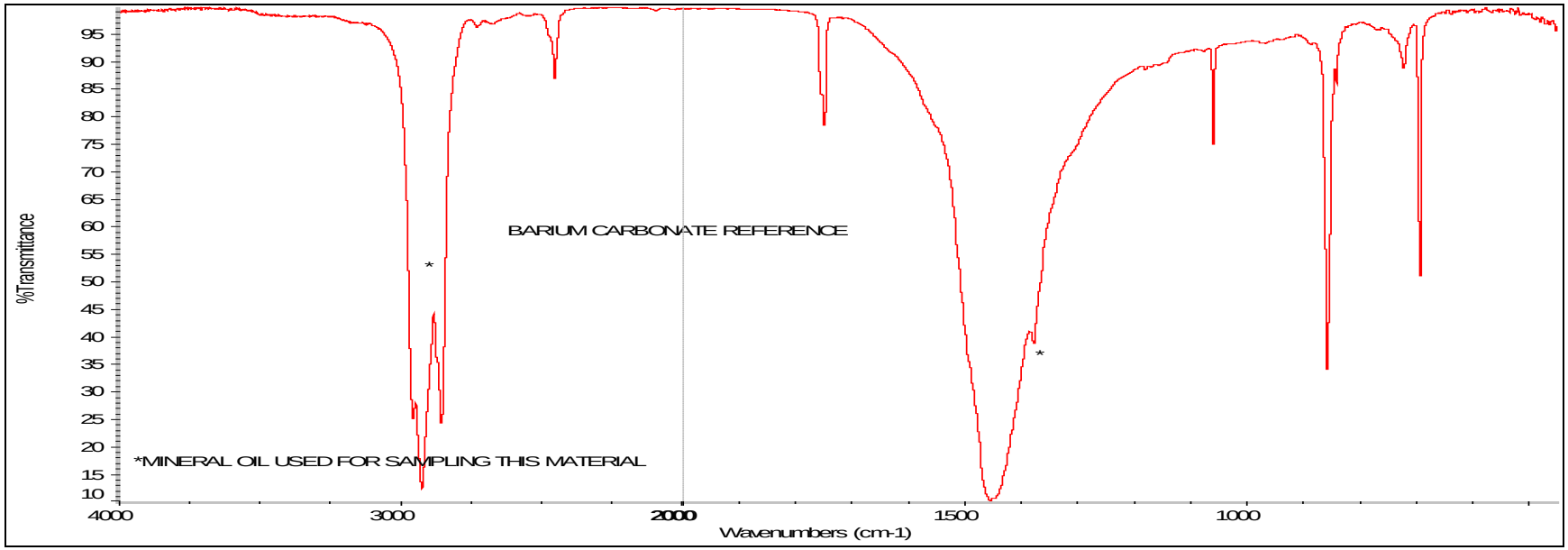
Figure 4: XRD pattern foroutside surface of the metal chunk with stick patterns for Al (red)), Si (green and Al(OH)3 (blue))



Infrared references of illite/smectite and montmorillonite minerals.



Infrared references of quartz and calcite (calcium carbonate) minerals.



Infrared reference of barium carbonate.