

Frontier Analysis, Ltd

TECHNICAL SERVICE RESPONSE NO.: UT077

Subject: Analysis of Plastic from the Mac Brazel Debris field aka Roswell Crash Site

Date: February 15, 2013

Requested By: Frank Kimbler

Reported By: P. A. Budinger
Analytical Scientist

Objective: Identify a plastic fragment from the Roswell debris field.

Conclusions:

- The specimen is identified as polystyrene. This is a common plastic first commercialized in the 1930s. The shape of the fragment suggests it is part of a plastic eating utensil. This is a very common use for polystyrene.¹ The earliest patent for a polystyrene eating utensil is February 21, 1950.² So, it is unlikely related to a crash retrieval team in 1947.

- The outside surface has suffered oxidative degradation i.e. suffered weathering due to exposure to sunlight under atmospheric conditions. Polystyrene is normally designed for a one time use,³ and is not weather resistant.⁴ It is difficult to estimate how long the sample was in the ground not knowing specific exposure conditions. A speculation, based on the appearance of the infrared spectrum and polystyrene's poor weathering properties, is that it was no more than 10-20 years.

Procedure:

The sample submitted was described as a "plastic fragment" from the Roswell crash site. It is part of a larger piece and submitted in a small plastic bag inside of a business envelope. The sample was received by this laboratory on January 14, 2013. Following are photographs of the sample 'as received' at this laboratory and the original specimen.

¹ <http://www.britannica.com/EBchecked/topic/469114/polystyrene>.

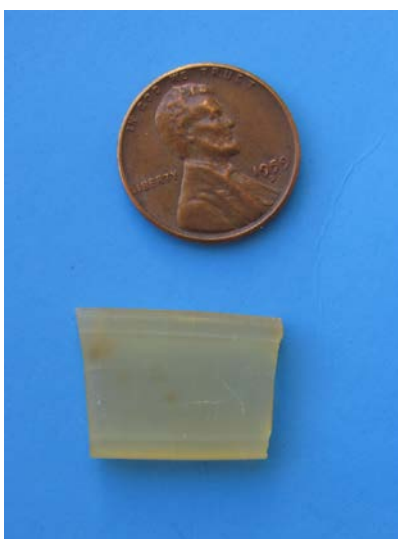
² Patent # 2,498,413 issued to Marvin I Glass for invention of a children's fork and spoon set inside a cartoon character.

³ Private Communication, Bruce Budinger Polymer Chemist.

⁴ <http://www.designinsite.dk/htmsider/m0006.htm>



Photograph by Frontier Analysis



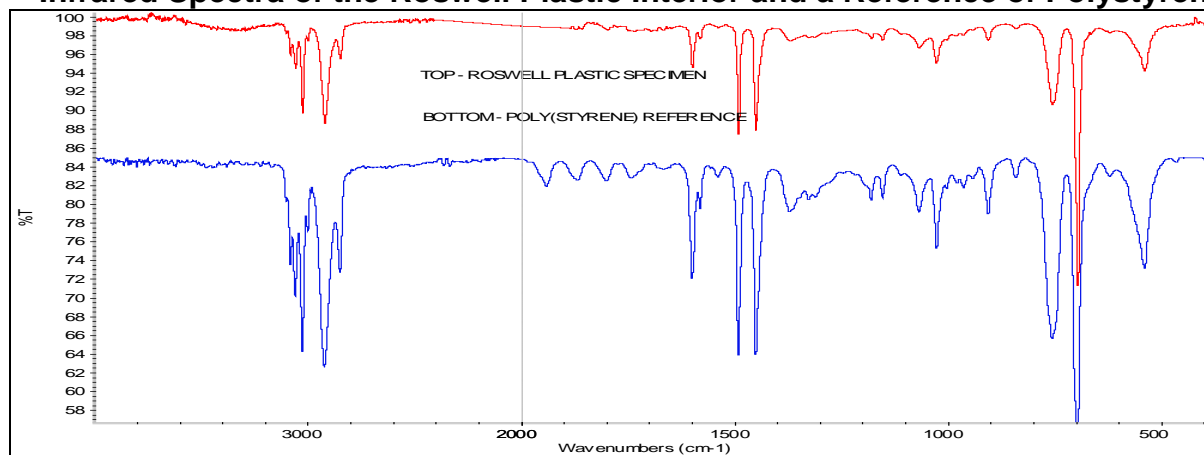
Photograph by Frank Kimbler

Infrared spectra were acquired of a small amount of loose surface scrapings of the sample, then scrapings from both sides (after loose material removal) and interior material of the plastic specimen. The data were obtained on the Thermo Electron Avatar 360 spectrometer using the Smart Herrick diamond sampling accessory.

Results:

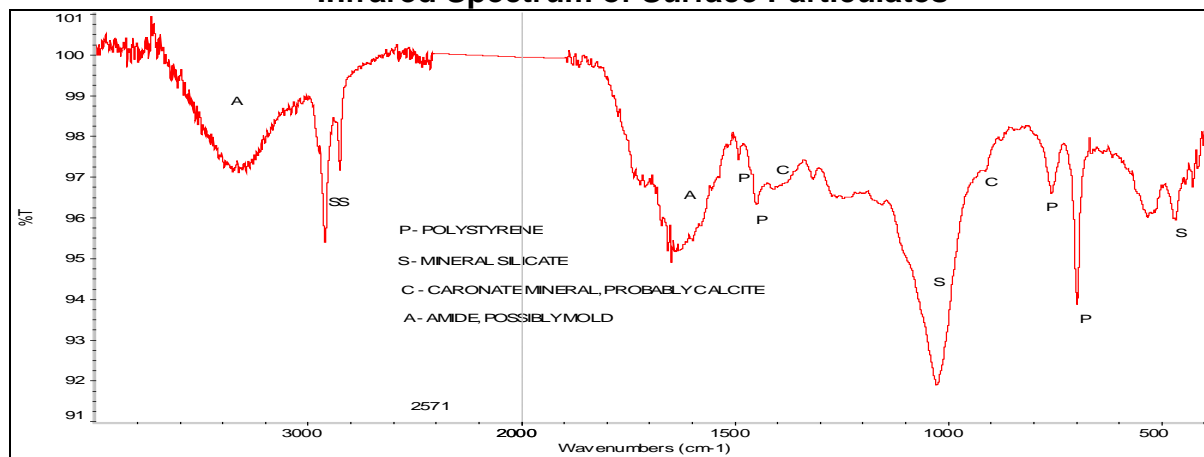
Infrared analysis of the plastic shows it is polystyrene. A spectrum of the interior of the plastic follows with a reference of polystyrene for comparison. The spectra match.

Infrared Spectra of the Roswell Plastic Interior and a Reference of Polystyrene



Very small amounts of surface particulates were on the sample. Infrared analysis shows they are composed environmental material such as mineral silicate and carbonate (calcite) i.e. dirt. There is also an amide material resembling a protein structure which is speculated to be traces of mold. Following is the spectrum with pertinent bands labeled.

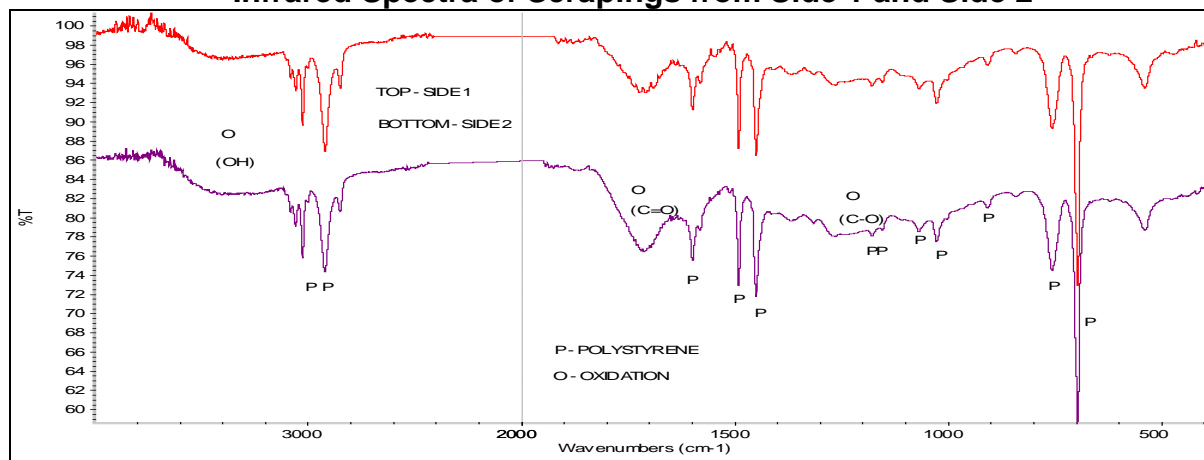
Infrared Spectrum of Surface Particulates



Infrared spectra of surface scrapings from both sides of the specimen (after dirt removal) show polystyrene bands, and in addition, bands between 3700-3100 cm⁻¹ (O-H), 1800-1650 cm⁻¹ (C=O) and 1300-1150 cm⁻¹ (C-O). These bands are evidence of oxidation/degradation of the polystyrene⁵, most likely due to exposure to sunlight under atmospheric conditions, i.e. weathering at the site.

⁵ Bengt Ranby and Julia Lucki, "New Aspects of Photodegradation and Photo-oxidation of Polystyrene" *Pure and Appl. Chem.*, Vol. 52, pp.295-303. Pergamon Press Ltd. 1980 Printed in Great Britain. (many other oxidation studies are referenced in this publication); Ayako Torikai and Hiroshi Shibata, "Photodegradation of Polystyrene: Effect of Polymer Structure on the Formation of Degradation Products" *The Arabian Journal for Science and Engineering*, Volume 24, Number 1C June 2002.

Infrared Spectra of Scrapings from Side 1 and Side 2



File: UT077

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