Research analist's initials	
Authorisation analist's initials	

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Analysis series	
Analist's initials	
Researcher	
Research report number	1
Code Spreadsheet	

Introduction:

Fifteen cosmetic products were supplied by the Plastic Soup Foundation which were analyzed for the presence of microplastics. In addition, an FTIR spectrometer was used for possible identification. An attempt was made to actually identify the plastic type of particles in 10 samples from these products using the FTIR.

E&H LIMS code	Description of sample	type
17/0487	Viviv Matte Liquid color sensational	LIPSTICK
17/0488	Color Riche Lipstick by Doutzen Collection	LIPSTICK
17/0489	Baby Lips Pink Punch	LIPSTICK
17/0490	Moisturising Lipstick 06	LIPSTICK
17/0491	les delices silky lip balm coco vanilla	LIPSTICK
17/0492	Colorburst lipbutter 085 Sugar plum	LIPSTICK
17/0493	Lasting Finish Soft Colour Blush. 120 Pink Rose	Face Powder/blush
17/0494	Lasting Performance. 109 natural bronze	Face Powder/blush
17/0495	Eye Studio, natural impact eyeshadow	Eye Shadow & Foundation
17/0496	Maxi Delight Bronzer. 01 medium skin	Face Powder/blush
17/0497	DermaSpa goodness. Silky body oil	body crème
17/0498	Lighten Up 2 Concealer	Face Powder/blush
17/0499	Multidimension topcoat 'a cut above'	nailpolish
17/0500	Garnier AmbrÃ© Solaire Kids 50+	sun crème

17/0501	Deodorant Motion sense, cotton dry algodÃn	deodorant

Method:

The samples were rendered down using a microwave. To do this approximately 0.25 to 0.5 grams of the substance was weighed using a scales. Then 2 ml MilliQ water was added and 5 ml concentrated nitric acid. The destruction took place according to the following program:

Segment	1	2	3	4	5
Power (%)	50	100	100	80	0
Pressure (PSI)	30	70	100	125	0
Time (mins)	10	5	5	10	15

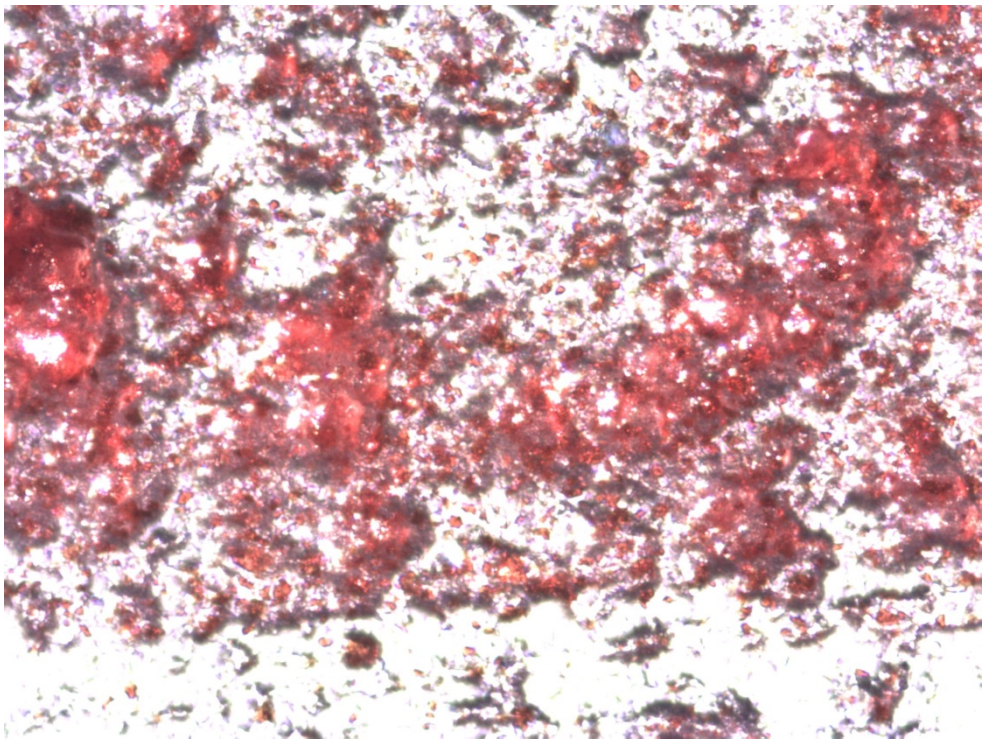
Then the sample was diluted with MilliQ to around 15 ml. The sample was then filtered through an Al_2O_3 filter with pore size 0.2 µm.
Subsequently a light microscope was used to view the particles on the filter.
Following this we attempted to produce a spectrum of the particles present using the FTIR spectrometer and this spectrum was compared to a reference spectrum from the FTIR library.
At the same time, photos were taken using the light microscope of the original product before destruction and of the particles found after destruction. Using the light microscope's software, we measured the size of the particles found.
As it is very difficult to gain good spectra, Raman spectroscopy was also used to observe the samples.

Results:

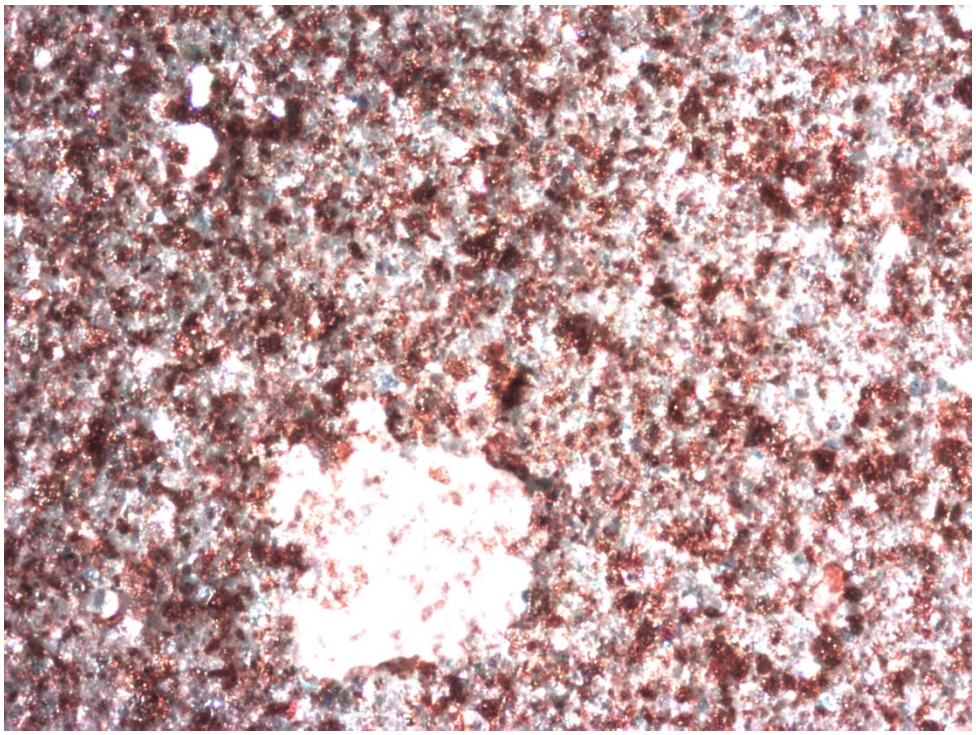
Sample 17/0490

Hema moisturising lipstick.

The photo below is of the original product using the light microscope. The product is a bright red color. The size of the particles is between 10 – 40 µm.
After destruction, the large white particles have a diameter of around 300 - 400 µm.

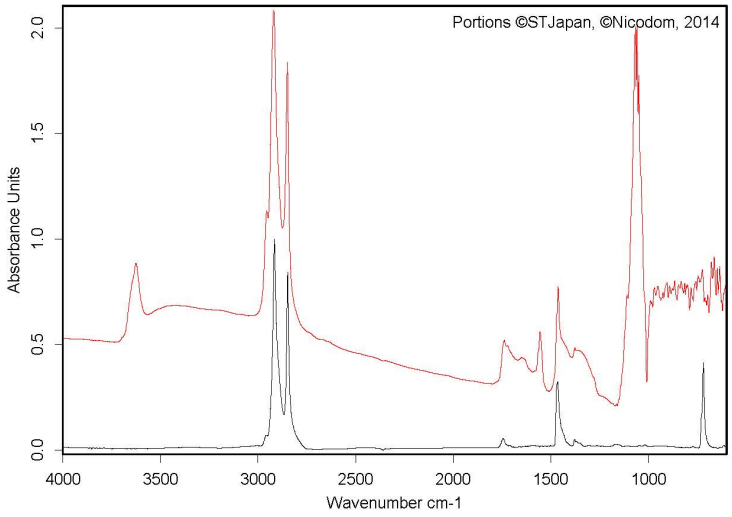


After destruction the bright red color has lessened and the particles are easily visible, between the red particles there are relatively large white particles.



These white particles give a FTIR spectrum which strongly resembles polyethylene.

Search Library **31/08/2017 11:38:56**



Compound Name	POLYETHYLENE LINEAR LOW DENSITY, ESCOF
Molecular Formula	(C2H4)n
Molecular Weight	
CAS Registry Number	9002-88-4
Sample Preparation	ATR single bounce
Manufacturer	Exxon
Comment	polyethylene
Reference	030/ MP0002
Copyright	(c) 2014 Nicodom
Entry No.	1154

Color	Hit Quality	Compound name	CAS Number	Molecular formula	Molecular weight
	605	POLYETHYLENE LINEAR LOW DENSITY, ESCORENE LLN100 4YB	9002-88-4	(C2H4)n	

Color	File	Path	Spectrum Type
	SEARCH_17_0490.0_AB_000002.10	C:\Users\Administrator\Documents\Bruker\OPUS_7.5.18\DATA	Query Spectrum

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Sample 17/0491

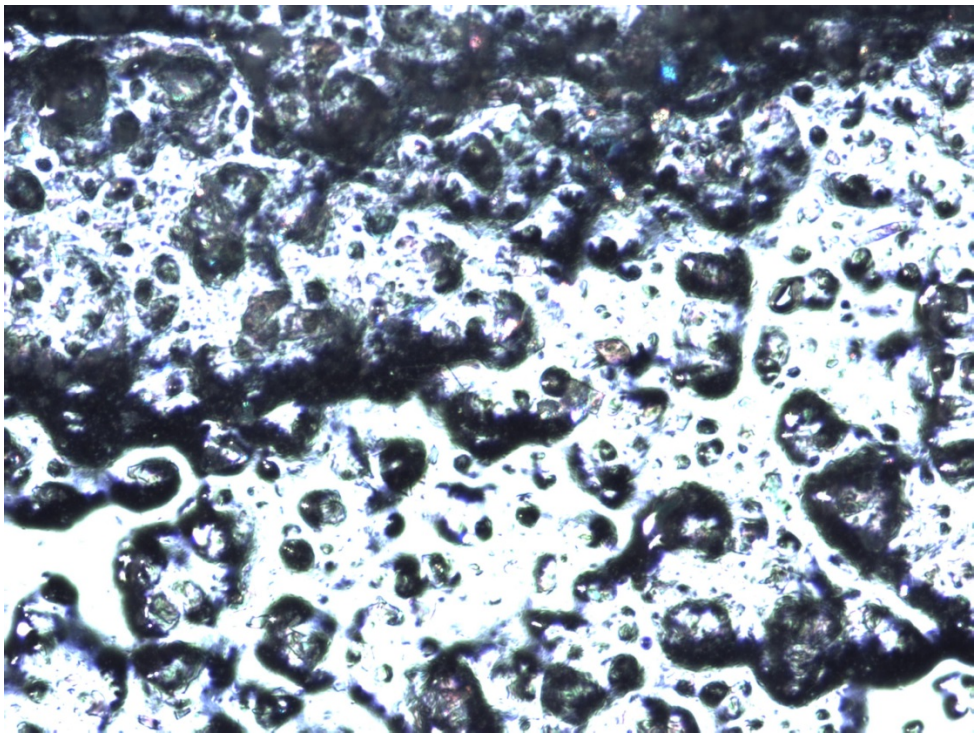
Douglas lip balm.

The product is a white greasy salve. Strikingly after destruction, a lot of glitter is left over which is not easily seen in the original product. Like the previous product, there are white particles among the glitters. In this sample, there are more lumps which are thicker than the glitter.

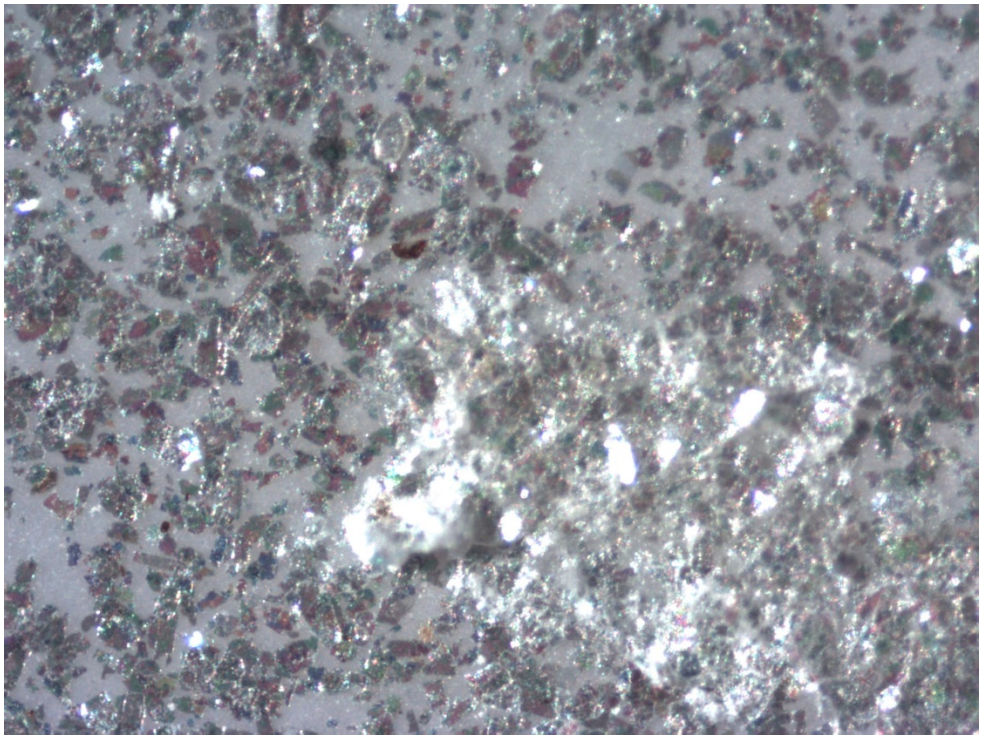
The colored glitter is between 10 and 60 µm in size. The large white lump on the photo has a diameter of around 700 µm.

In this sample, the FTIR also shows a spectrum for the white lumps which resembles polyethylene.

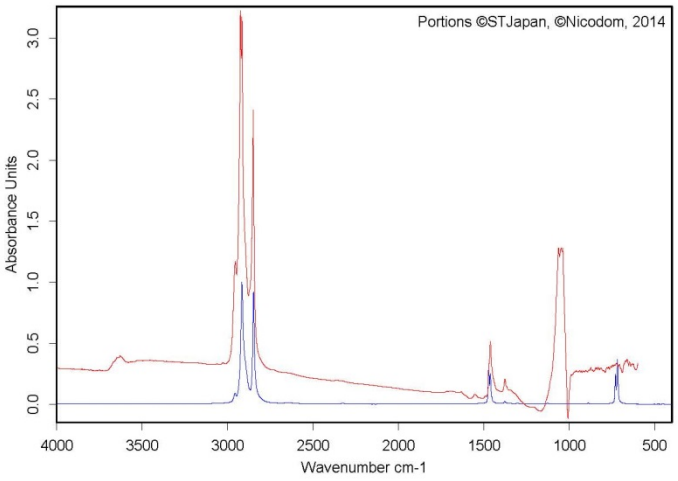
Before destruction:



After destruction:



Search Library **31/08/2017 11:44:00**



Compound Name	POLYETHYLENE WAX: HIGH DENSITY TYPE: PC
Molecular Formula	
Molecular Weight	
CAS Registry Number	9002-88-4
Sample Preparation	ATR single bounce
Comment	lubricants
Reference	TAG1005a/ TAG1005A
Copyright	(c) 2014 STJapan Inc.
Entry No.	12942
Library name	ATR-LIB-COMPLETE-1-472-2.S01

Color	Hit Quality	Compound name	CAS Number	Molecular formula	Molecular weight
	575	POLYETHYLENE WAX: HIGH DENSITY TYPE: POLYMERIZATION TYPE(ZIEGLER CAT.)	9002-88-4		

Color	File	Path	Spectrum Type
	SEARCH_17_0491b.0_AB_000003.1	C:\Users\Administrator\Documents\Bruker\OPUS_7.5.18\DATA	Query Spectrum

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Sample 17/0499

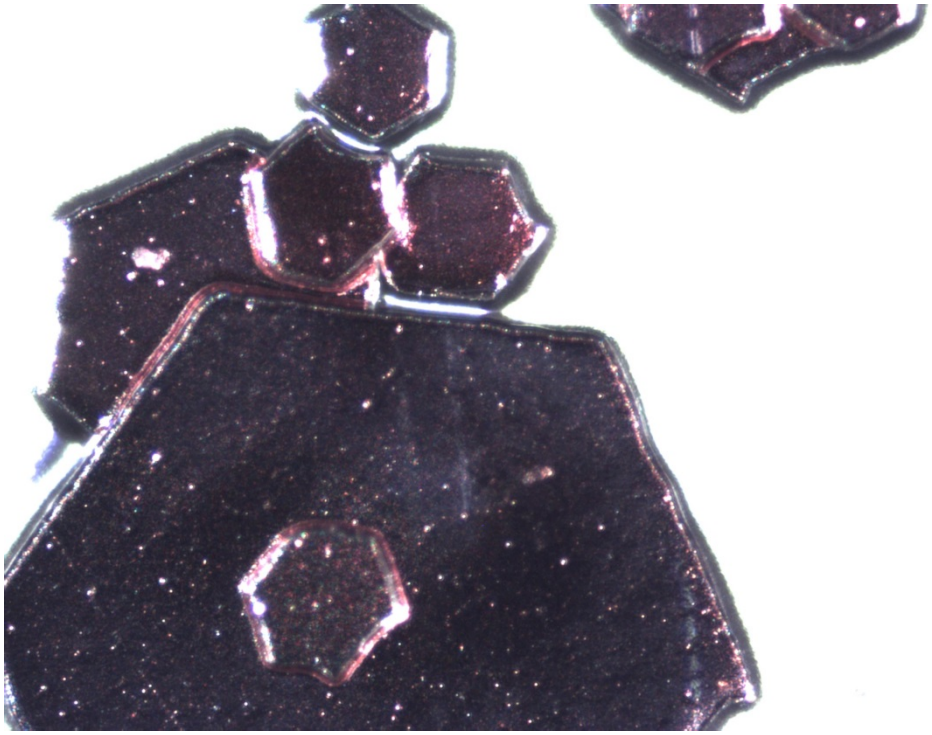
L'Oreal Essie nailpolish.

The product contains lots of glitter. These are a kind of hexagonal structures similar to stop signs in different sizes, varying between 200 and 1200 µm. All have a purplish color.

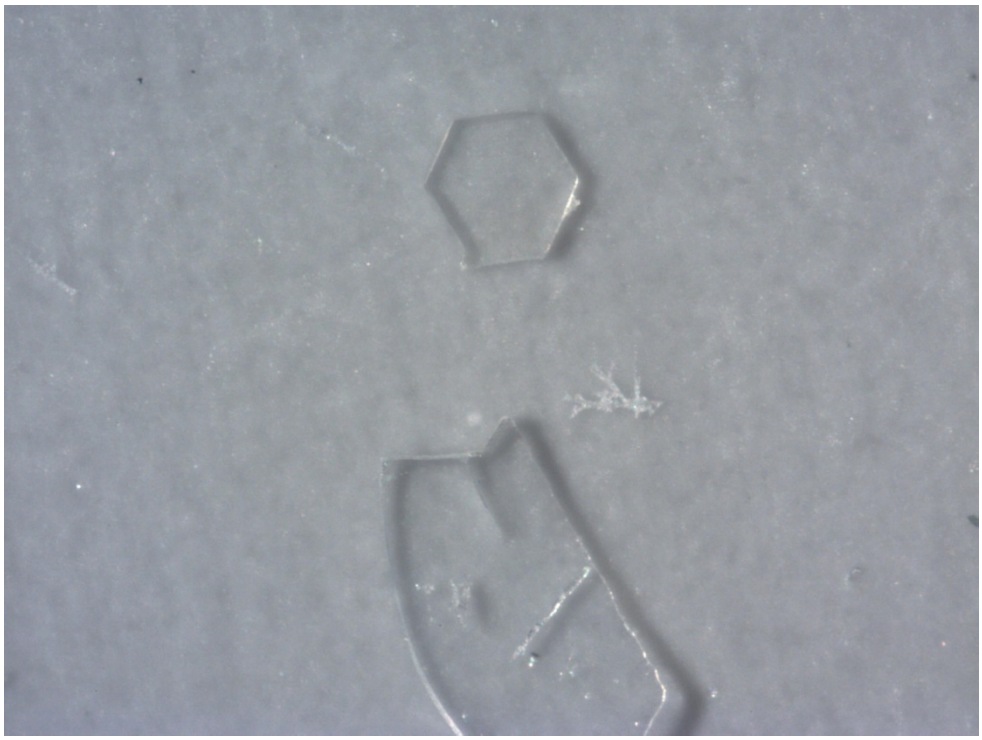
After destruction, you see that the structure of the glitters remains intact, but the color has completely disappeared. The benzene-like structures have now become transparent.

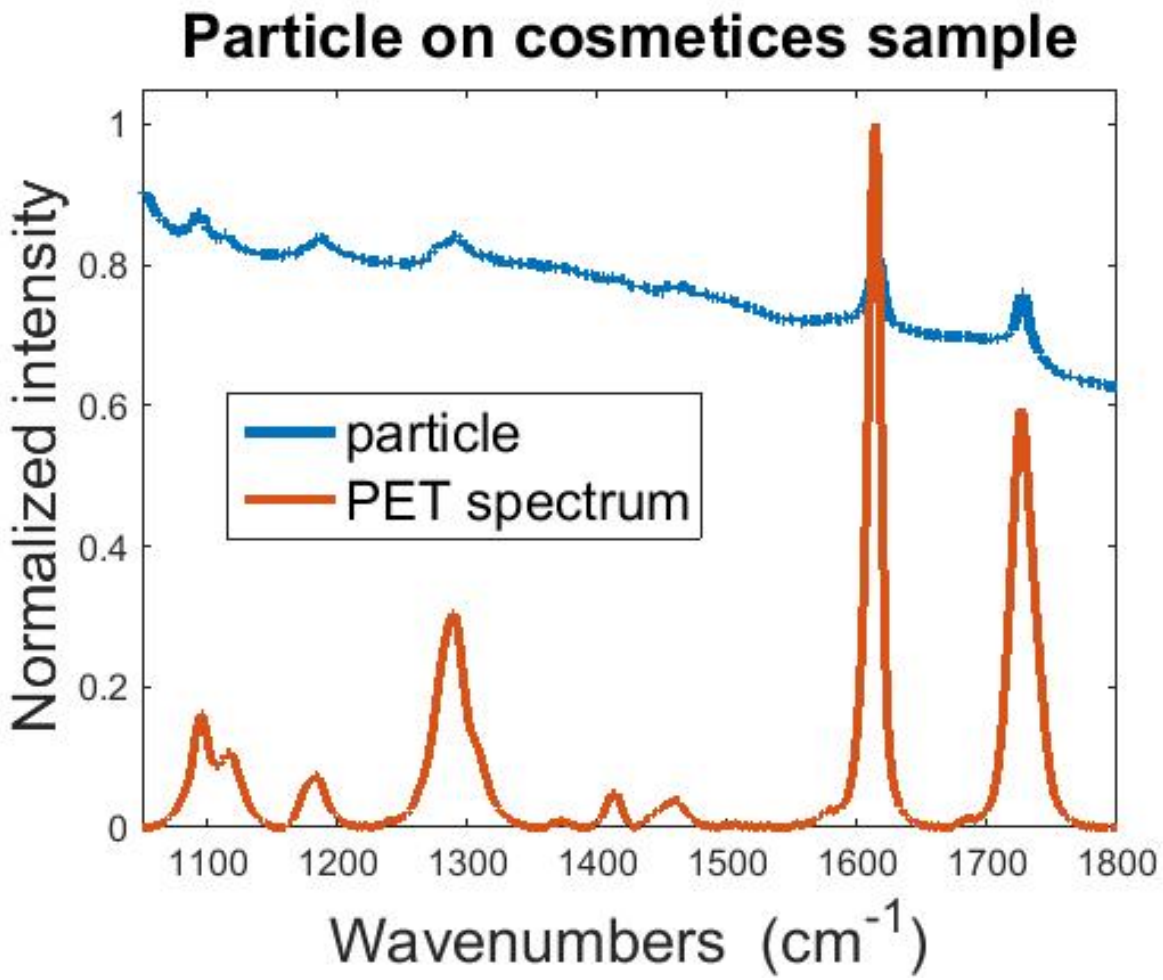
It was not possible to get a very clear FTIR spectrum. However, the spectrum gained from this sample using the Raman technique clearly resembled a PET spectrum.

Before destruction:



After destruction:

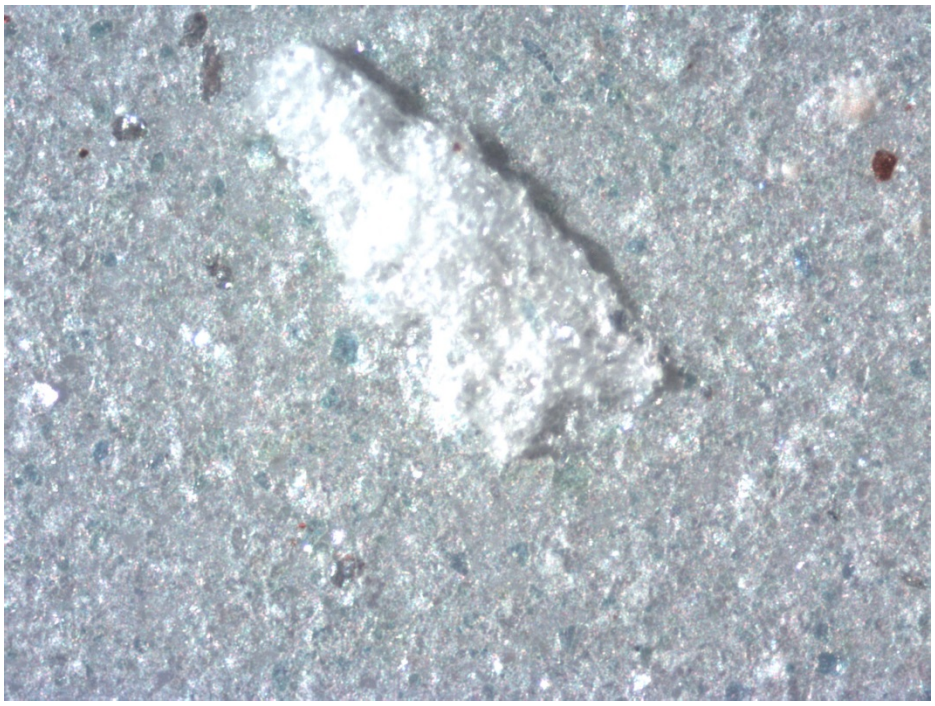




Unfortunately in the remaining samples it was not possible identify the particles using the FTIR technique, although they were present after destruction. In two samples, 17/0487 and 17/0488, the filter appeared to be almost clean and the polymer fraction was probably too small to show up using this method.
The following photos of samples show there is glitter (after destruction), but it could not be identified.

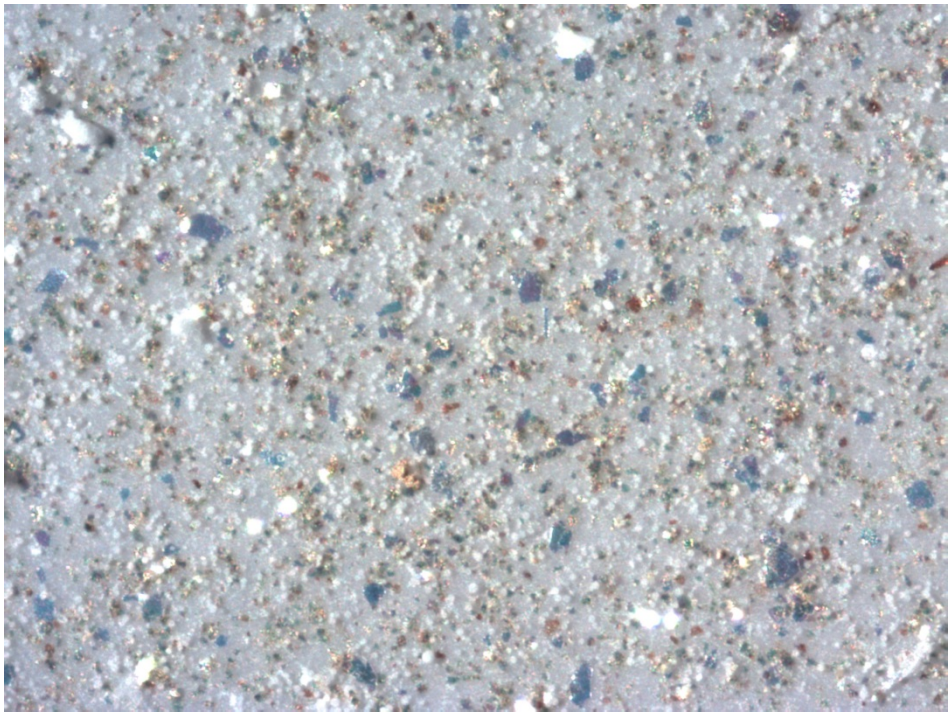
Sample 17/0492

Revlon lip butter.



Sample 17/0497

Dove body oil



Sample 17/0498

Rituals concealer

In addition to the set of samples supplied by the Plastic Soup Foundation, another three samples were identified which were already present at the E&H lab.

Sample 11/1063

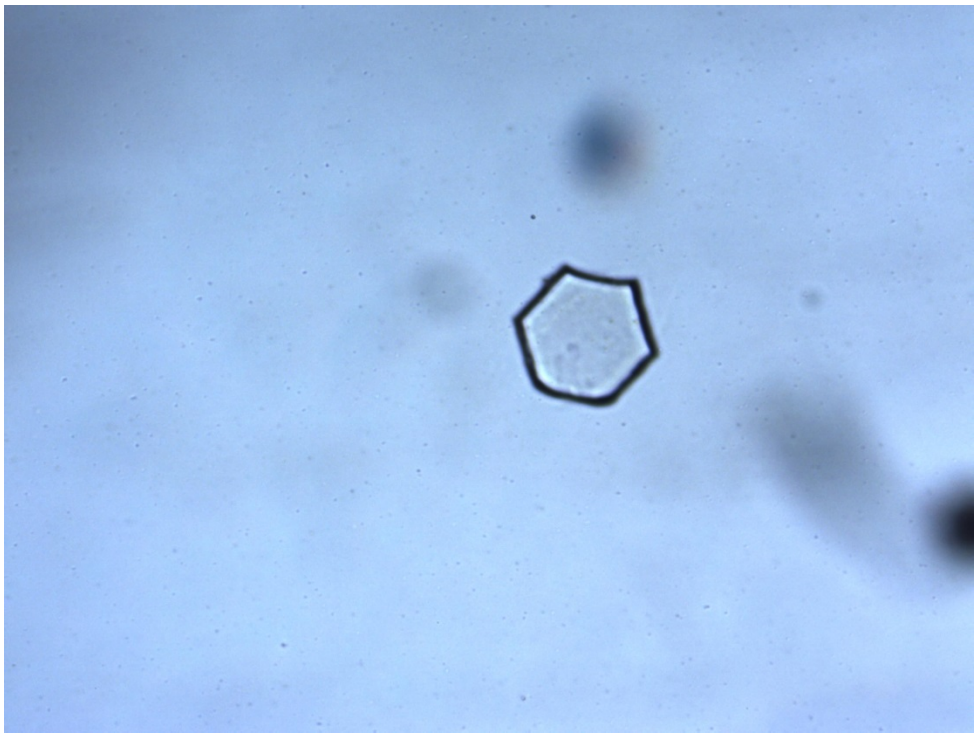
Etos bubblebath for kids.

The original product is a green colorful soup solution and on the light microscope, you can also see "benzene-like" particles similar to the shape in sample 17/0499. However, this time the particles are transparent and not colored. They are around 250 µm in size. Unlike the sample 17/0499, the particles are all around the same size.

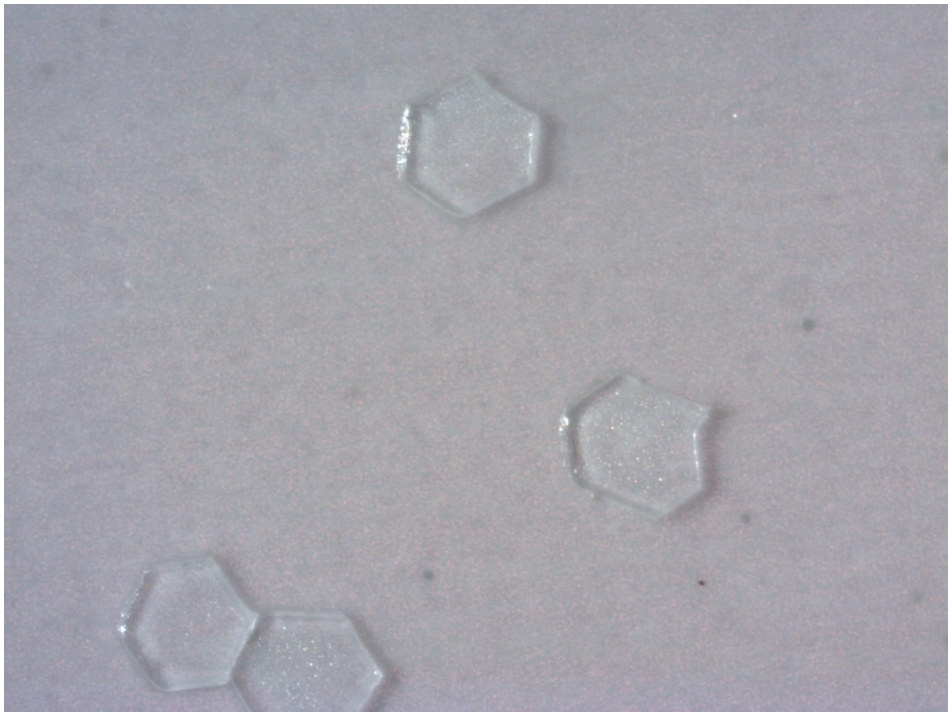
This sample was produced in a slightly different way. The product was dissolved in a 30% H_2O_2 solution and then filtered through an Al_2O_3 filter.

The spectrum produced from the particles using the FTIR technique resembles the PET spectrum.

Before the H_2O_2 treatment:



After the H2O2 treatment and filtration:



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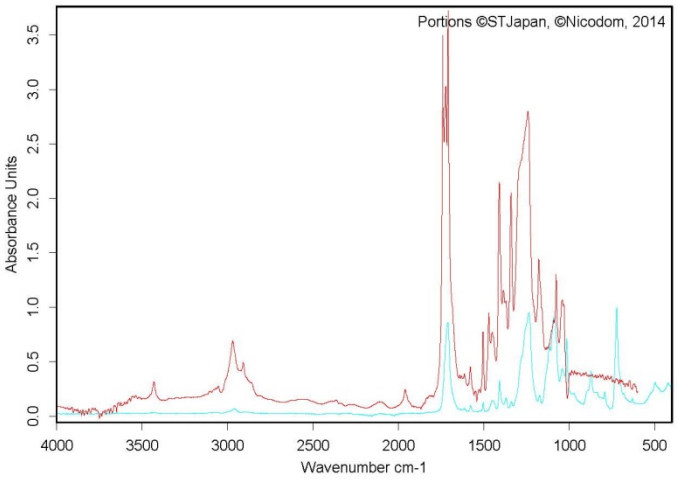

Compound Name	POLY(ETHYLENE TEREPHTHALATE)
Molecular Formula	(-COC6H4COOCH2CH2-)n
Molecular Weight	
CAS Registry Number	29154-49-2
Sample Preparation	ATR single bounce
Reference	J60191/ A00685
Copyright	(c) 2014 STJapan Inc.
Entry No.	527
Library name	ATR-LIB-COMPLETE-1-472-2.S01
Library description	ATR-FTIR-Library COMPLETE, Vol. 1

Color	Hit Quality	Compound name	CAS Number	Molecular formula	Molecular weight
	273	POLY(ETHYLENE TEREPHTHALATE)	29154-49-2	(-COC6H4COOCH2CH2-)n	

Color	File	Path	Spectrum Type
	SEARCH_11_1063.0_AB_000000.1	C:\Users\Administrator\Documents\Bruker\OPUS_7.5.18\DATA	Query Spectrum

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Sample 11/1062

L'Oreal exfotonic scrub.

This is also a greenish syrupy fluid. Under the light microscope, you can see lots of small balls, roughly 200 µm in diameter.

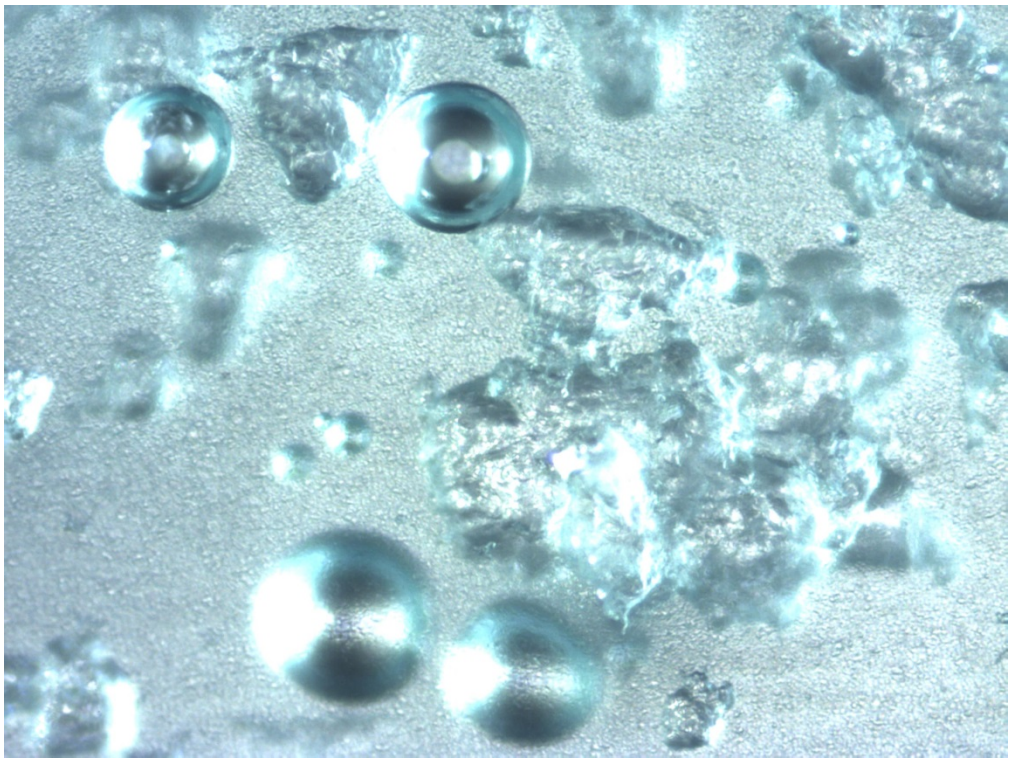
After the H2O2 treatment whitish pieces are left over which clump together.

These pieces could not be analyzed properly using the FTIR transmission measurement. It was also not possible to find a good spectrum in reflection mode.

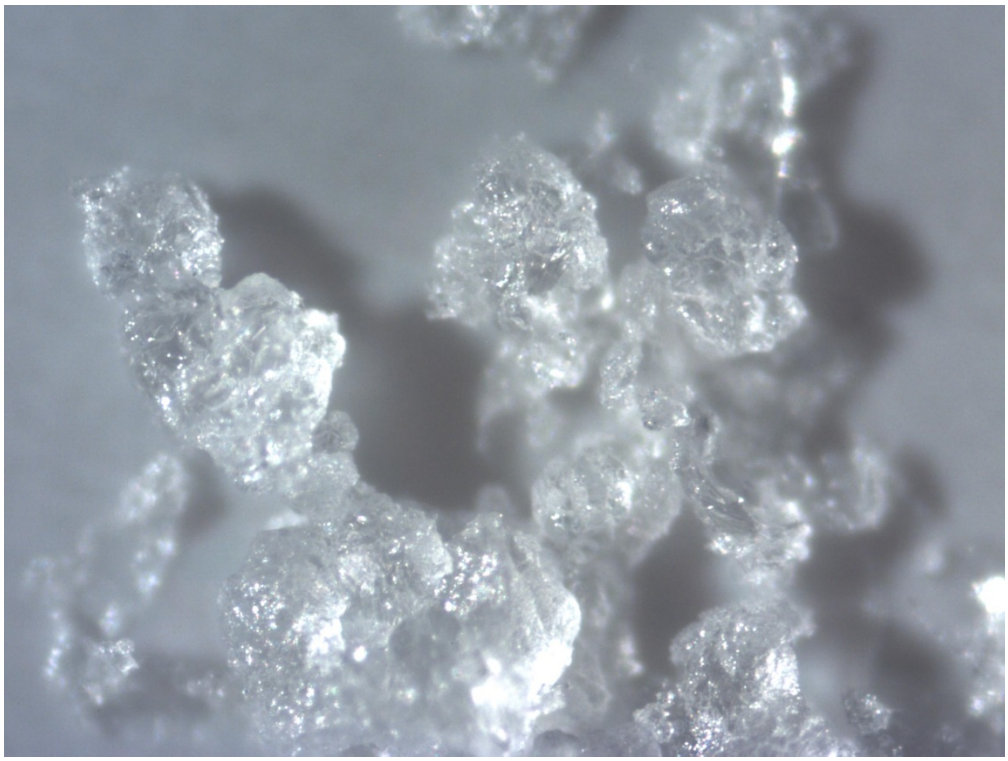
Because the particles clump together into one large lump, it was possible to produce a spectrum using the ATR technique.

This spectrum greatly resembles polyethylene.

Before the H_2O_2 treatment.



After the H_2O_2 treatment and filtration.



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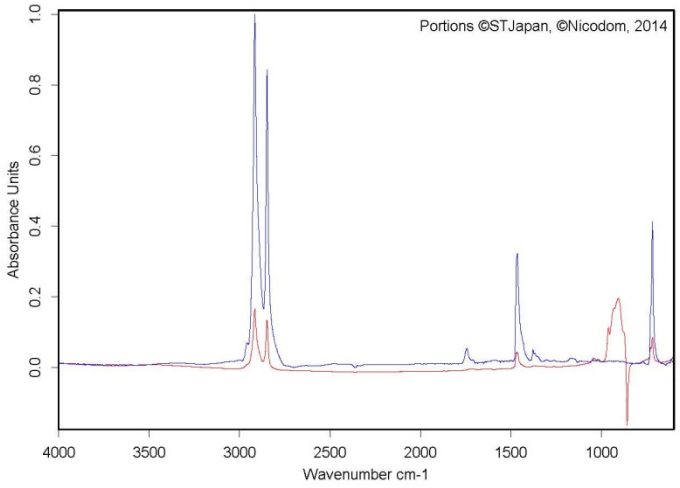

Compound Name	POLYETHYLENE LINEAR LOW DENSITY, ESCOI
Molecular Formula	(C2H4)n
Molecular Weight	
CAS Registry Number	9002-88-4
Sample Preparation	ATR single bounce
Manufacturer	Exxon
Comment	polyethylene
Reference	030/ MP0002
Copyright	(c) 2014 Nicodom
Entry No.	1154

Color	Hit Quality	Compound name	CAS Number	Molecular formula	Molecular weight
	529	POLYETHYLENE LINEAR LOW DENSITY, ESCORENE LLN100 4YB	9002-88-4	(C2H4)n	

Color	File	Path	Spectrum Type
	SEARCH_11_1062e.0_AB_000000.0	C:\Users\Administrator\Documents\Bruker\OPUS_7.5.18\DATA	Query Spectrum

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Sample 13/0872

Elmex toothpaste

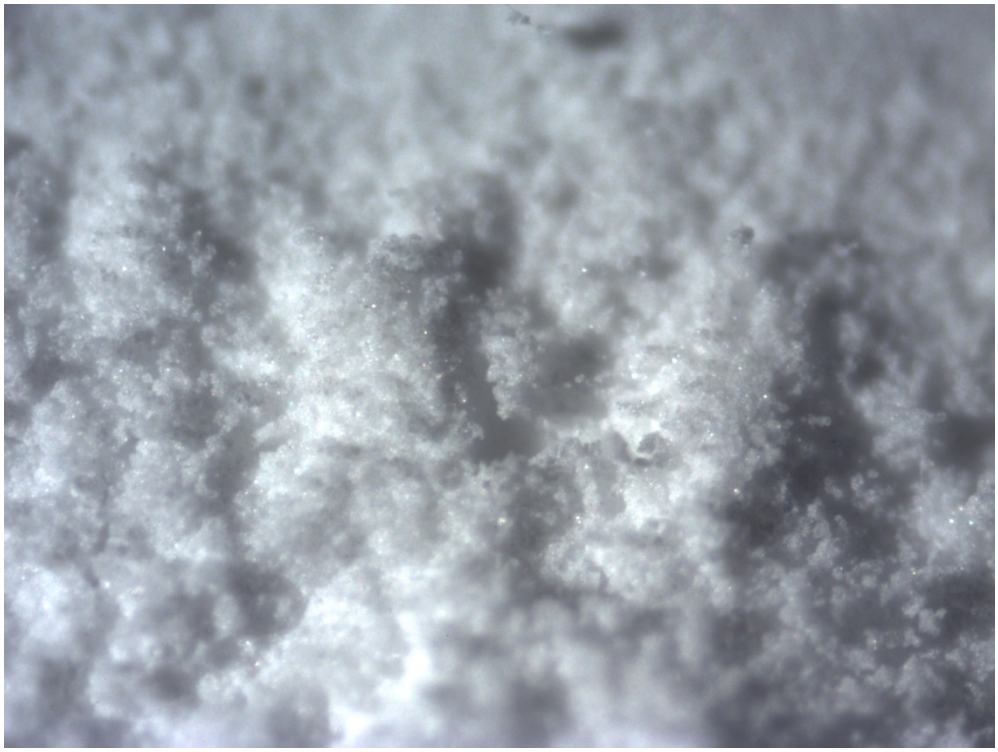
In this sample, you can see lots of small round balls/particles under the light microscope, which are all around the same size (10 - 20 µm).

After treatment with H2O2 the sample looks almost the same, balls/particles are still roughly the same size.

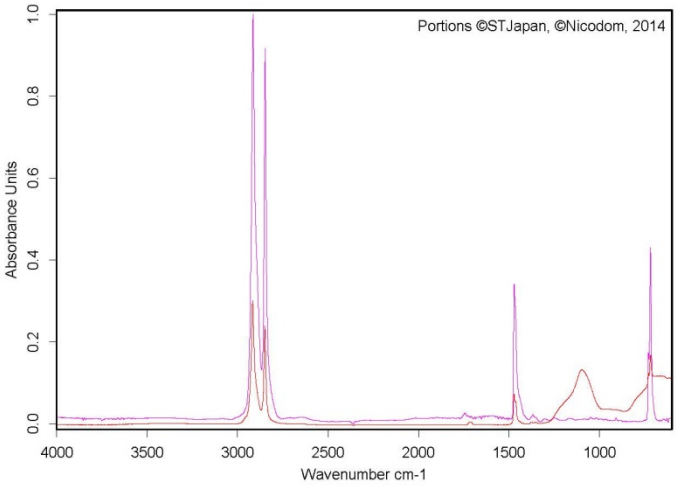
The FTIR spectrum great resembles polyethylene.

Before the H_2O_2 treatment:

After the H_2O_2 treatment and filtration:



Search Library **31/08/2017 16:44:12**



Compound Name	POLYETHYLENE, HOSTALEN GM 7040
Molecular Formula	(C2H4)n
Molecular Weight	
CAS Registry Number	9002-88-4
Sample Preparation	ATR single bounce
Manufacturer	Hoechst
Comment	polyethylene
Reference	311/ MP0151
Copyright	(c) 2014 Nicodom
Entry No.	1283

Color	Hit Quality	Compound name	CAS Number	Molecular formula	Molecular weight
	783	POLYETHYLENE, HOSTALEN GM 7040	9002-88-4	(C2H4)n	

Color	File	Path	Spectrum Type
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