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.

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

<table>
<thead>
<tr>
<th>Segment</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (%)</td>
<td>50</td>
<td>100</td>
<td>100</td>
<td>80</td>
<td>0</td>
</tr>
<tr>
<td>Pressure (PSI)</td>
<td>30</td>
<td>70</td>
<td>100</td>
<td>125</td>
<td>0</td>
</tr>
<tr>
<td>Time (mins)</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Then the sample was diluted with MilliQ to around 15 ml. The sample was then filtered through an Al₂O₃ 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.
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:
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% H₂O₂ solution and then filtered through an Al₂O₃ filter.

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

Before the H₂O₂ treatment:
After the H2O2 treatment and filtration:
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$_2$O$_2$ treatment.

After the H$_2$O$_2$ treatment and filtration.
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 greatly resembles polyethylene.
Before the H$_2$O$_2$ treatment:

![Image of before H$_2$O$_2$ treatment]

After the H$_2$O$_2$ treatment and filtration:

![Image of after H$_2$O$_2$ treatment and filtration]
Search Library

31/08/2017 16:44:12

<table>
<thead>
<tr>
<th>Color</th>
<th>Hit Quality</th>
<th>Compound Name</th>
<th>CAS Number</th>
<th>Molecular Formula</th>
<th>Molecular Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>783</td>
<td></td>
<td>POLYETHYLENE, HOSTALEN GM 7040</td>
<td>9002-88-4</td>
<td>(C2H4)n</td>
<td></td>
</tr>
</tbody>
</table>

Color | File | Path | Spectrum Type
---|------|------|-----------------|
SEARCH_elmer_red2.0_A8_0000000 | C:\Users\Administrator\Documents\bruker\GPRUS_73.18\Data | Query Spectrum |