Sponges - Are they yesterday's Technology? – Part 1.

A University of Birmingham SEM Study.

Hygan Products Limited - April 2023

Sponge Technology Case Study Part 1: - Hygan commissioned the University of Birmingham to utilise their extensive technical capabilities to analyse the 'structure' of several leading car washing products to understand whether the 'product structure' would reveal the ***'key to protecting car paintwork when cleaning a car'.***

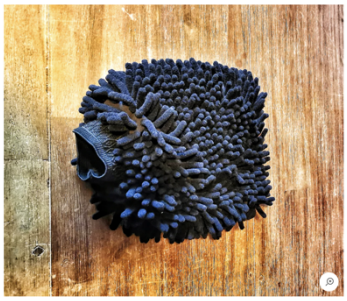
Once the characteristics had been established, the ***Sponge Technology Case Study Part 2*** could be completed which consisted of a full car detailing product assessment undertaken by IDA (International Detailers Association) Certified Detailer - T H Detailing www.thdetailing.co.uk

Products Under Test: - Photographs of 5 materials received for the microscopy analysis: (a) #1 (Hygan Profile Sponge), (b) #2 (Standard Sponge), (c) #3 (Microfibre Wash Mitt), (d) #4 (Stealth Wash Mitt – Blue noodle type), and (e) #5 (Ultra-Soft Lambswool Mitt).

#1 Hygan Ultimate Profile Sponge.

2 Standard Sponge.

#3 Microfibre Wash Mitt



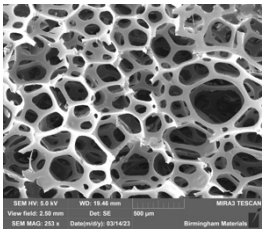
#4 Stealth Wash Mitt – Blue noodle type

#5 Ultra-Soft Lambswool Mitt

Detailing & Valeting Professionals are asking - is a sponge safe for car paintwork, or is this yesterday's technology?

Hygan, who have been producing high quality technical sponge products for over 60 years, are well placed to investigate as one of the leading suppliers to not only the global ceramics sector but are increasingly manufacturing sponge products for the car care sector, so can their high-end ***'Ultimate Profile Sponge'*** change the industry view on using sponges for car paintwork?

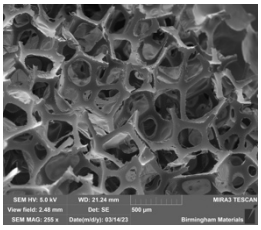
What do the microstructures tell us -



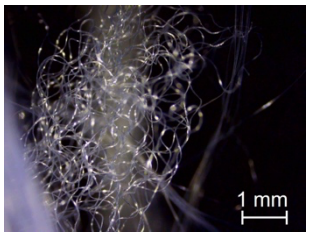
It can be observed that the morphology of the Hygan sponge contains a three- dimensional porous network structure, with a bare sponge skeleton size of approximately 40 µm and pore size of 40 – 200 µm. The high magnification SEM image shows that ***the surface of the sponge skeleton was smooth-edged***.

#1 Hygan Ultimate Profile Sponge.

The bare sponge skeleton size is also comparable in the range of 40 – 50µm but the pore size was slightly larger, at 50 – 500 µm. The high magnification SEM image showed that the surface of the sponge skeleton was less smooth than the Hygan sample, ***indeed some jagged striation markings could be observed.***

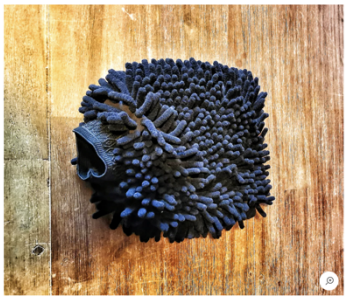


2 Standard Sponge.

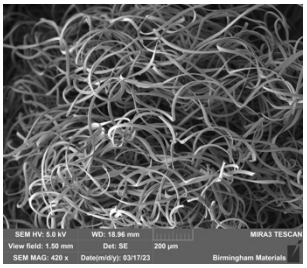


The OM micrographs of sample (Microfibre Wash Mitt) ***The morphology consists of smooth fibres weaved together, with a width of single fibre ranging a few microns.,*** unfortunately we were unable to perform SEM on this product, as there was considerable risk that the fibres would be unretrievable and therefore contaminate the SEM chamber for further operation.

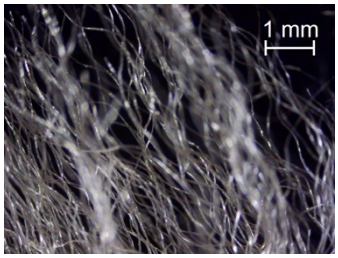
#3 Microfibre Wash Mitt



The morphology consists of highly dense packing of individual fibres weaved together, with a width of single fibre ranging a few microns to tens of micron. The structure consists of loosely held ***smooth fibres***, with a width of single fibre ranging a few microns.



#4 Stealth Wash Mitt – Blue noodle type



The OM micrographs of sample #5 The morphology consists of loosely held ***smooth fibres, with a width of single fibre ranging a few microns.***

#5 Ultra-Soft Lambswool Mitt

University of Birmingham Laboratory Conclusions

In this report, SEM and OM micrographs of 5 different cleaning materials were taken. SEM analysis was only performed on samples #1, #2 and #4, while OM analysis was performed on all 5 samples. The following concluding remarks are made:

The sponge samples #1 Hygan and #2 a Standard Sponge consisted of a three-dimensional porous network structure with the ***Hygan (#1) sample displaying a smooth sponge skeleton,*** whereas the ***Standard sponge (#2)*** sample had a similar skeleton, but containing ***evidence of striations and jagged surfaces*** which may be **more prone to scratching a surface** when in contact.

The Hygan sample has a ***smaller pore size distribution***. It is hypothesised that these smaller pores ***will retain any micron particles of grit better than the larger pores*** – in which they will be prone to simply falling out, rather than ***being retained away from the surface to be cleaned.***

The larger pores of the standard sponge would, in theory, be better for retaining larger particles of grit, but at 500 microns, these are likely so large that they would fall under gravity rather than remain on the surface, thus there is no benefit to the larger pores of the Standard sponge, compared to the Hygan.

The cloth fibre samples #3, #4 and #5 consisted of fibres weaved together. These materials are known for having ***excellent surface area*** in contact with a surface for cleaning, due to their ***high density of fibres in the weave***.

Microfibre cloths may constantly change their “effective” pore size as the fibres are moved and manipulated by the user, which may cause debris or grit to become loose and migrate toward the surface. The ***Hygan sponge however, would more controllably retain its pore size*** – and thus ***potentially retain the grit away from the surface***, as the sponge is manipulated by the user.

Hygan Comment -

The question to be addressed is – ***‘can a sponge be used safely for car paintwork, or is this yesterday’s technology’?***

Well, the SEM study conducted by the University of Birmingham on various car wash products, including the Hygan Ultimate Profile sponge, established that ‘***quality and structure does count’, where*** high-end technical sponge materials are sufficiently structurally different, they ***should compete with the very best car cleaning products on the market today.***

So, can sponges make a resurgence in today’s car cleaning sector? – Well, the Hygan sample having a ***smaller pore size distribution would retain any micron particles of grit more effectively than the larger pores found in standard low-cost sponges*** – essentially ***being retained away from the surface to be cleaned***. This, when combined with a ‘***Pyramid type profile’*** makes the Hygan sponge a real contender in the professional detailing and valeting sector.

The evidence of this is described within ***case study 2*** – where a Mercedes E400 was professionally machine polished to create an even paint surface, followed by a demanding car cleaning program with all the above products to establish which, if any, damage the fine paint finish after 8 weeks of motoring in rain, snow and dirt.

What result did we get? See Case Study 2.

Glossary –

1. ***µm*** = Micron = A micron is one thousandth of a millimetre.
2. **SEM** = Scanning Electron Microscope.
3. **OM** = Optical Microscopy.