THE FACTS ON FLÜGGER® ACRYLSPALTER:

A study of the properties of a commercial filler

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INTRODUCTION

Commercially prepared fillers are enjoyed for their time efficiency, workability and variety. Some have undergone rigorous testing by the conservation community, but others have managed to avoid scrutiny, such as Flügger® Acrylspalter (right), an acrylic-based filler consisting of butyl methacrylate and calcium carbonate [1]. This study had set out to evaluate the putty against Polycell Fine Surface Polyfilla® (right), a well-known infilling material in conservation [2]. Polyfilla® is a vinyl-based filler containing in its composition an acrylic Veo Va-PVAC copolymer dispersion and calcium carbonate [3]. With the aim of assessing the suitability of Flügger® for use in conservation, properties that are considered important in a filler were tested in comparison to Polyfilla®. Investigations were made into the fillers' suitability as substrates for paint and the effects of ageing on shrinkage, flexibility and solubility. Fourier transform infrared spectroscopy with attenuated total reflectance (FTIR-ATR) was used to analyze the chemical properties.

EXPERIMENTAL

Study	Description
Painting Tests	Ease of application and removal of paint was studied using three types of paints, all ivory black in colour: acrylic (Liquitex®), gouache (Winsor & Newton) and watercolour (Winsor & Newton). Five samples of each filler were tested for each type of paint, for a total of 30 samples. The paint was applied with a paint brush and removed with water-saturated cotton after 24 hours. Quantitative analyses were carried out with a colourimeter (Minolta) before and after paint application and after paint removal using the CIE L*a*b* colour system.
Ageing Tests	Prepared samples were subjected to natural ageing and thermally accelerated ageing (Despatch LEA-169) at 70°C and 50% RH for 28 days. Five samples of each filler were made for every ageing condition to test the fillers' shrinkage and flexibility. Ten samples of each filler for every ageing condition were made to test the fillers' solubility. A total of 80 samples underwent testing. 1. Shrinkage: dimensions (length, width and height) were measured before and after ageing. 2. Flexibility: samples were bent around five different objects of varying radii after ageing (left). 3. Solubility: samples were immersed in water and acetone for 24 hours after ageing.
Instrumental Analysis	FTIR-ATR (Nicolet Avatar 320) was used to analyze the chemical properties of the two fillers. One sample of each filler was analyzed in the wet state and six samples of each filler were analyzed in the dry state before and after natural and thermally accelerated ageing. A total of 26 samples were analyzed.

RESULTS

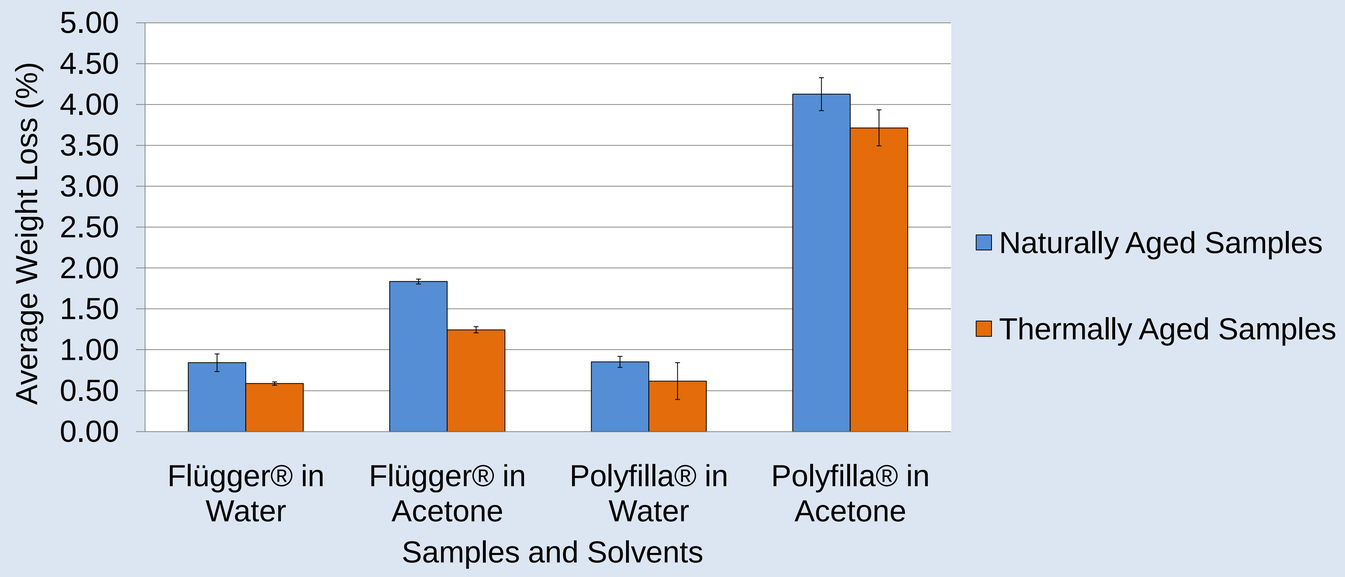
Painting Tests

Qualitative and quantitative analyses yielded similar results for both fillers after the application of paint. The results varied in the ease of removal:

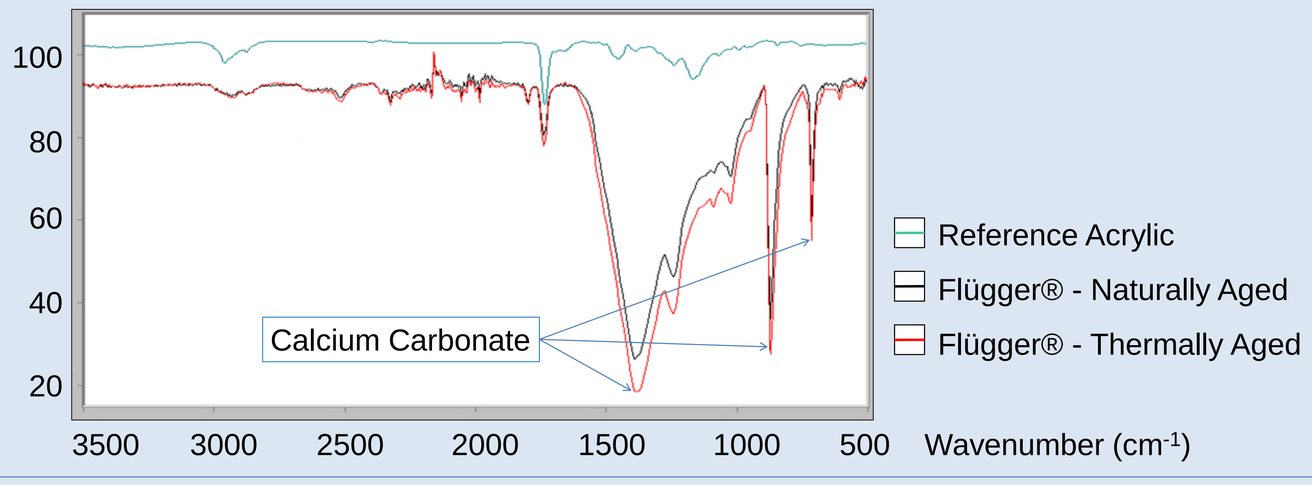
1. Acrylic paint: was equally difficult to remove from both Flügger® and Polyfilla®. The paint adhered equally well to both fillers.
2. Gouache paint: was easier to remove from Flügger® than from Polyfilla®. The paint adhered better to Polyfilla® than to Flügger®.
3. Watercolour paint: was easier to remove from Flügger® (below, left) than from Polyfilla® (below, right). The paint adhered better to Polyfilla® than to Flügger®.

Ageing Tests

1. Shrinkage: Flügger® experienced greater dimensional changes than Polyfilla® after both natural and thermally accelerated ageing. Except for the change in height seen in the Polyfilla® samples, both fillers shrunk to a greater degree after natural ageing in ambient conditions.
2. Flexibility: Polyfilla® displayed much greater flexibility than Flügger® after natural and thermally accelerated ageing. The type of ageing condition did not have a significant effect on the results.
3. Solubility (below): both fillers were equally soluble in water after natural and thermally accelerated ageing; Polyfilla® was more soluble in acetone. Samples that were aged naturally solubilized to a greater degree than samples that were aged thermally.



Instrumental Analysis



1. Analysis confirmed that both Flügger® (left) and Polyfilla® contain calcium carbonate (peaks near 1400 cm^{-1} and at 870 cm^{-1} and 712 cm^{-1}).
2. While both Flügger® (left) and Polyfilla® were found to contain acrylic, Polyfilla® was revealed to contain a greater amount of acrylic.
3. Neither Flügger® (left) nor Polyfilla® underwent any significant changes upon ageing.

CONCLUSIONS

In comparison to Polyfilla®, the results have revealed Flügger® to be a poorer substrate for paint, more susceptible to shrinkage, less flexible and less reversible. Based on these accounts, Flügger® may be regarded to be less appropriate for use in conservation than Polyfilla®. In terms of its chemical properties, Flügger® was found to be stable. Physically, however, the results should be considered and questioned when preparing a treatment proposal. Further investigations into both fillers' reaction to changes in temperature and relative humidity are recommended.

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REFERENCES

[1] Conservation Resources (U.K.) Ltd., 'Technical leaflet Flugger Acrylic Putty (FLU66)', product information sheets, Conservation Resources (U.K.) Ltd. (2003) (unpublished).
[2 and 3] Craft, M.L, and Solz, J.A., 'Commercial vinyl and acrylic fill materials', *Journal of the American Institute for Conservation* 37(1) (1998) 23-34.

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