**Introduction**

Paint losses in high impasto are a common problem for conservators treating modern and contemporary paintings on fabric supports. Inherent adhesion problems can cause large pieces of paint to delaminate from the support and in the worst case to be lost. The reasons for this is, in most cases, the weight of the material, which makes the support sag, putting paint layers at risk. Therefore, it is important to consider the density of the fill material used when choosing a fill material for an area of loss in thick paint layers.

Low-density bulking agents offer important weight reductions for a given volume of binder. As they are lighter-weight materials made of small, hollow glass, ceramic or plastic spheres, Microspheres promise the greatest weight reduction compared to other low density bulking agents.

The aim of this study was to assess the impact of Microlight™ microspheres on the mechanical properties of High Solid Gel by Golden. The results obtained were compared to those for Becker’s Latex Spackle, a commercial acrylic filler, sometimes used for filling losses in thick paint layers.

**Experimental**

**Materials Tested**

- High Solid Gel (Matte) (HSG)
- HSG + Microlight (50% PVC)
- HSG + Microlight (60% PVC)
- Becker’s Latex Spackle

**Tests Performed**

- **Handling properties** – Qualitative analysis of mixing, spreading, holding of peaks, smoothing
- **Shrinkage behaviour** – Thicknesses of the same samples were compared fresh and after 48 hours of drying.
- **Density** – Samples of 20mm³ were cut out of a casting with a scalpel blade. Length, width and thickness of all samples were measured with a micrometer. The volume was calculated and the mass determined. The density was calculated as follows:
  \[ \rho = \frac{m}{V} \]
- **Aging** – The samples were thermally aged at 70°C at 50% RH for 52 hours and exposed to elevated UV-light intensities in a UV chamber set at an intensity of 1.1kw/m² and 50°C for 120 hours. (400 Museum years of natural aging)
- **Colour stability** – This was established in CIELAB space. Seven points along each casting were analysed before and after aging.
- **Flexibility** – This was determined by the Mandrel bending test on unaged and aged samples
- **Tensile Strength** – This was measured on unaged and aged samples using a uniaxial tensiometer.

**Results**

**Results**

- **Handling Properties & Shrinkage**
  - **Becker’s**
  - **HSG**
  - **HSG + 50% PVC**
    - Consistency between HSG and HSG+60% PVC. Mixing difficult. Easily spread. Holds peaks well. Foams less than HSG during smoothing with water. No formation of drying cracks.
  - **HSG + 60% PVC**

**Shrinkage & Density**

- **Becker’s**
  - HSG: 7.2 ± 0.16
  - HSG+50%: 14 ± 0.86
  - HSG+60%: 16 ± 1.5

**Colour stability**

- **Becker’s**
  - Unaged: 114.0
  - Aged: 145.0

- **HSG**
  - Unaged: 2.36
  - Aged: 5.91

**Tensile strength**

- **Becker’s**
  - ΔE*: 7.2 ± 0.16

- **HSG**
  - ΔE*: 7.0 ± 0.67
  - HSG+50%: 14 ± 0.86
  - HSG+60%: 16 ± 1.5

**Conclusion**

- Adding inorganic and thermoplastic microspheres to High Solid Gel (HSG) has an impact on its mechanical behaviour as well as its shrinkage and density.
- Whereas HSG samples did not fail during tensile and Mandrel bending tests, samples with 50% PVC by weight did.
- A second set of samples with 60% PVC by weight did not fail during the tensile test.
- The tensile strength of HSG+60% was 2.36 GPa, which is significantly higher than that of HSG+50% (1.5 GPa). However, the tensile strength of HSG+50% was higher than that of HSG+60%.
- Colour changes after aging were significant. Further tests concerning the mechanical stability of the aged samples need to be undertaken.

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