Suitability of Aquazol®-Based Filler Materials for Fabric-Supported Paintings

Golya Mirderikvand, Art Conservation Program, Queen's University

ABSTRACT

The polymer poly(2-ethyl-2-oxazoline), commercially known as Aquazol®, has recently become a commonly employed adhesive in the field of art conservation. The suitability of Aquazol® as a fill material for use in the conservation of paintings on fabric supports was assessed by comparing its relevant properties to a traditional gesso, rabbit skin glue (RSG) chalk filler.

INTRODUCTION

The aim of this study was to explore Aquazol's suitability as a binder when dissolved in water and mixed with calcium carbonate as an inert material, in producing stable fills for paintings on fabric supports. The focus was on the 200 and 500 grades of this resin, which are two of the highest molecular weight grades of Aquazol® currently available through its manufacturing company Polymer Chemistry Innovations, Inc.

<table>
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<tr>
<th>Adhesive</th>
<th>PVC</th>
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<tr>
<td>25% Aquazol® 200</td>
<td>67% &amp; 75%</td>
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<tr>
<td>20% Aquazol® 500</td>
<td>60% &amp; 67%</td>
</tr>
<tr>
<td>10% RSG</td>
<td>67% &amp; 75%</td>
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Chosen adhesive concentrations and pigment (inert) to volume concentrations (PVC)

EXPERIMENTAL

Various relevant tests were performed on both grades of Aquazol® and a traditional gesso, as a standard for point of comparison. The following methods of investigation and tests were performed on each type of sample.

1. Shrinkage of cast samples in moulds of known dimensions upon drying.
2. Workability based on the handling and texturing properties.
3. Colour stability upon light ageing with Xenon arc lights at an irradiance levels of 1.10 W/m², wavelength of 420 nm, and black panel temperature of 63°C for 336 hours.
4. Reversibility of light aged samples.
5. Tensile strength at 23%, 50%, and 75% RH of samples using a uniaxial tensiometer.
6. Flexibility of unaged samples compared with aged samples aged at 50% RH and 75°C for 21 days.
7. Chemical analysis using Fourier transform infrared spectroscopy (FTIR) of light aged samples vs. unaged samples.
8. Gel permeation chromatography (GPC) of light aged samples vs. unaged samples.

RESULTS & DISCUSSION

1. Shrinkage: RSG fillers shrank more than the Aquazol® fillers upon drying.
2. Workability: Aquazol® fillers were much easier to handle and texture than the rabbit skin glue fillers and Aquazol®200 held peaks better than Aquazol®500.
3. Colour stability: Aquazol 500 samples were the only fills that had a measureable colour change, where the 60% PVC samples had the greatest change, becoming lighter and more blue.
4. Reversibility: All fill types had a very good rating in terms of remaining reversible in water after light ageing, however, the Aquazol® fills were slightly easier to reverse than the rabbit skin glue fills.
5. Tensile strength: The modulus of elasticity of the Aquazol® fills dropped dramatically with an increase in RH; whereas, the RSG samples showed small variations at different RH levels.
6. Flexibility: For both naturally aged and accelerated aged samples, Aquazol® samples were more flexible than RSG samples; in comparing the two different PVC's for each adhesive, it was found that samples with lower pigment to volume concentrations are more flexible.
7. FTIR: No change in the structural chemistry of the polymers were detected when comparing samples before and after light ageing.
8. GPC: Upon light ageing, Aquazol® samples have a wider peak of molecular weight distribution curve, reflecting the distribution of the new chain lengths as a result of chain scission that has occurred following light ageing.

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