

Varnish Coatings

for Contemporary Murals in Canada



Introduction

Protection of outdoor murals in Canada is a multi-dimensional challenge. Contemporary murals are usually varnished with synthetic coatings, but many people who make murals (muralists) do not use any coating at all. There is a limited understanding of the aging characteristics of synthetic coatings in general, so this project hopes to shed some light on this issue.

The effectiveness of commercially available varnish coatings were tested to see how well they protected outdoor murals against deterioration. Three varnish coatings were applied to wood, brick, and glass supports, and subjected to extreme conditions. Samples without varnish were also made as controls.

The change in properties was then evaluated with a number of techniques.

Experimental

Supports:

- oak plywood (prepared with a sealer)
- clay brick (prepared with a sealer)
- glass slides

Paints, all used Golden Fluid Acrylic Colours:

- titanium white (2380)
- yellow oxide (2410)
- permanent green light (2250)

Varnishes:

- Varathane Diamond Polyurethane (A)
- Golden Mineral Spirit Acrylic Varnish (B) (with GAC 500 as isolation coat)
- Genesis Coatings Graffiti Melt (C)

Conditions:

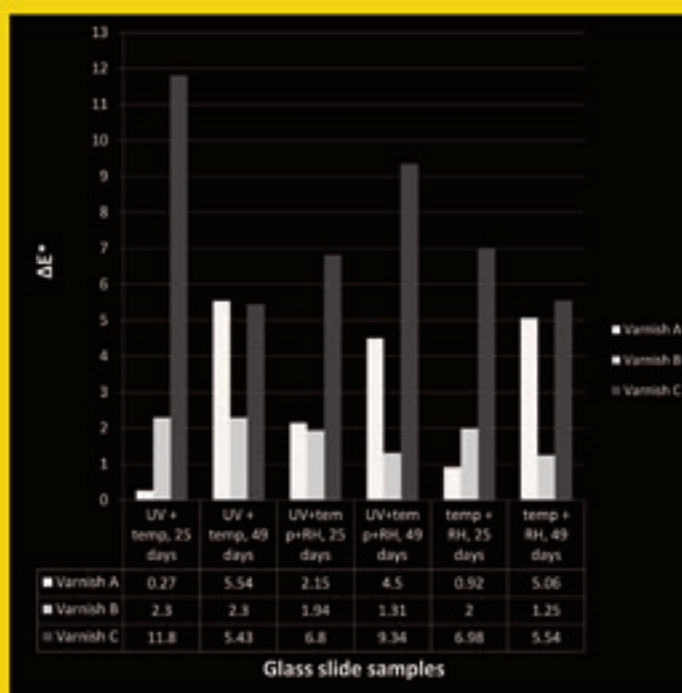
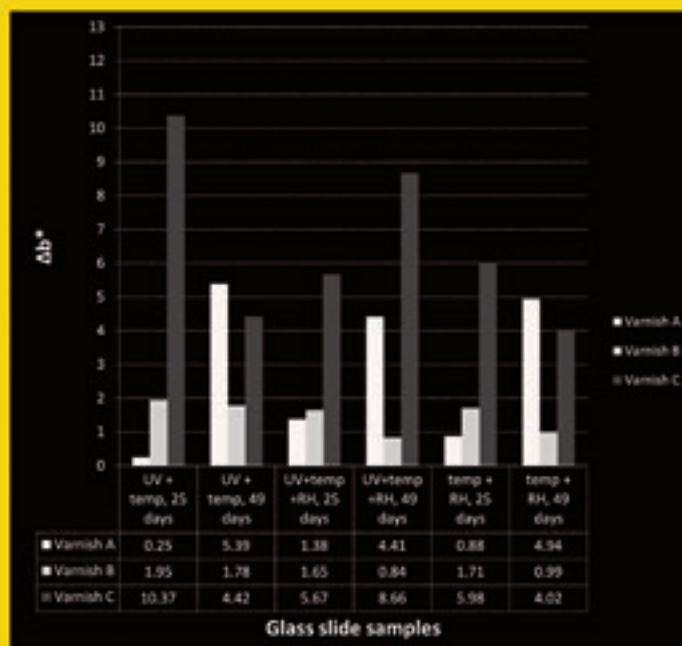
- hot and cold temperatures
- UVa light radiation
- relative humidity (RH) fluctuations
- samples aged for 25 days (equivalent to 2 years and 10 months of normal outdoor aging) OR
- samples aged for 49 days (equivalent to 5 years and 6 months of normal outdoor aging)

Tests include:

- visual examination
- colour
- gloss
- scratch resistance
- solubility

Results

The colour and gloss changes showed how the materials degraded over different lengths of time, under different conditions, with different underlying layers. The following two graphs show changes in the amount of yellowing (Δb^*), and overall colour changes (ΔE^*), for the glass slides samples.



Both graphs: Varnish A = polyurethane, Varnish B = MS acrylic, Varnish C = Graffiti Melt

Scratch resistance was measured using the ASTM D3363 Film Hardness by Pencil Test. Pencils containing differing lead strengths (with 6B = softest, 6H = hardest, HB = midway between the two, and so on) were dragged across the coatings, and the pencil that left a scratch was recorded.

SAMPLE	Test Results	SAMPLE	Test Results
1A	4B	2A	HB
3A	HB	4A	HB
5A	3B	6A	HB
1B	H	2B	2H
3B	H	4B	2H
5B	H	6B	2H
1C	6B	2C	6B
3C	6B	4C	6B
5C	6B	6C	6B

Varnish A = polyurethane, Varnish B = MS acrylic, Varnish C = Graffiti Melt
Samples in Group 1, 3, 5 were aged for 25 days.
Samples in Group 2, 4, 6 were aged for 49 days.

Solubility was measured by testing the samples with various solutions, and recording which varnishes are most easily removed.

SAMPLE	Solution Required	SAMPLE	Solution Required
1A	isopropanol	2A	isopropanol
3A	isopropanol	4A	isopropanol
5A	isopropanol	6A	isopropanol
1B	toluene/ethanol	2B	toluene/ethanol
3B	toluene/ethanol	4B	xylene
5B	toluene/ethanol	6B	xylene
1C	hot distilled water	2C	hot distilled water
3C	hot distilled water	4C	hot distilled water
5C	hot distilled water	6C	hot distilled water

Ranking of solutions from weakest to strongest:
hot distilled water, isopropanol, xylene, toluene/ethanol (mixed solution)

Conclusions

Most stable varnish:

Golden MS Acrylic varnish ("B") with GAC 500
-least amount of colour and gloss change
-hardest varnish during scratch test

Most difficult to remove from support:

Golden MS Acrylic varnish ("B") with GAC 500
-required xylene and/or ethanol and toluene

Easiest to remove from support:

Genesis Coatings Graffiti Melt ("C")
-most colour change but is non-toxic

Most stable sample:

unvarnishes samples ("D") on wood support
-very little colour, gloss, or textural changes
-stable under all conditions and aging times



Above: Samples of glass, brick and wood, varnished with Genesis Coatings Graffiti Melt, after heat aging, light aging, and humidity fluctuations for a period of 49 days.



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