An Evaluation of Glazing Materials and their Effect on Fading in Fluorescent Acrylic Paints

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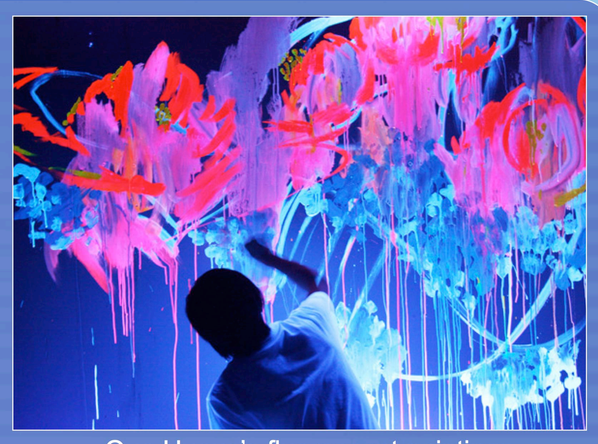
Background

- Fluorescent paints have been used in artwork from the mid-twentieth century onwards, being particularly prominent in the pop art movement. In addition to their bright colours and luminosity, they are also known to be fugitive.
- Art conservators use glazing materials to protect artwork without applying anything directly to the paint surface. Museum environments usually exclude ultraviolet light, so the artworks are only subjected to the visible part of the electromagnetic spectrum.
- Besides protection from ultraviolet light, can glazing offer protection from light damage in the visible spectrum?
- The goal of this research was to evaluate fluorescent acrylic paints from the Tri-Art company as well as three different glazing options currently used in museums to determine how the paints maintain their colour and vibrancy with overlaying glazing.

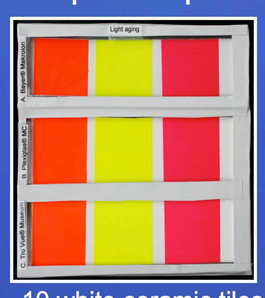


Que Huoxo's fluorescent paintings

Experimental

Samples were prepared on white ceramic tiles with Tri-Art fluorescent acrylic paint (orange, yellow, magenta), and glazing: TruVue® Optium Museum Acrylic, Bayer -Sheffield Makrolon® Polycarbonate, and Plexiglas® MC. Ten tiles (90 samples overall) were subjected to different tests and conditions:

Sample Preparation



- 10 white ceramic tiles
- 3 fluorescent paints
- 3 types of glazing
- aluminum tape

Tests and Conditions

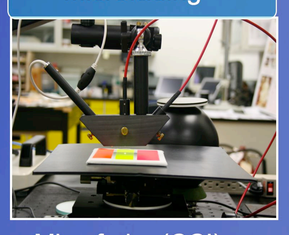
Natural Light

- daylight (window)
- 46 days
- non-filtering glass
- full-spectrum light

Extreme Light

- Q-Sun Test Chamber
- xenon light source
- 125 hours, 250 hours
- 1.10 W/m² at 420 nm

Microfading



- Microfader (CCI)
- xenon light source
- 4 million lux
- d=0.4 mm, 5-10 mins

Colorimetry

- Minolta Colorimeter CR300
- delta E measurements
- CIE L*a*b* 1976
- colour change

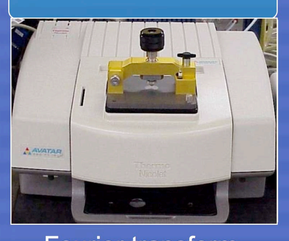
UV-VIS spectrometry

- UV-VIS Spectrometer
- xenon light source
- spectral absorption and differences

Py/GC-MS

- Analytical Pyroprobe
- gas chromatography-mass spectrometry
- paint analysis

FTIR

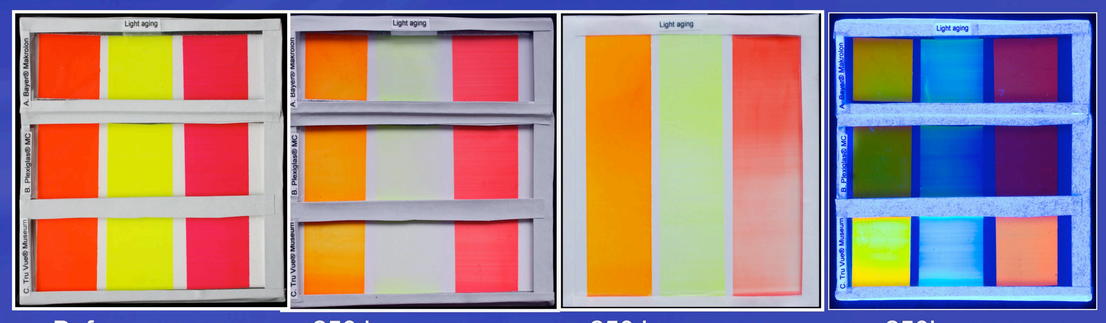


- Fourier transform infrared analysis
- paint analysis

Results

Visual Observations

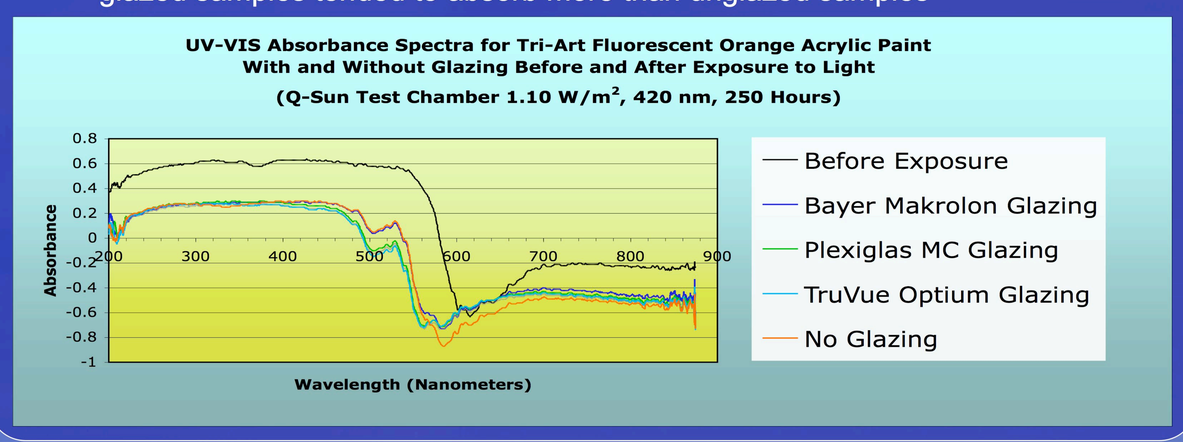
- significant colour change and fading with more light exposure
- more fading in paints under glazing materials after exposure to xenon light
- less fluorescence in all exposed samples under ultraviolet light

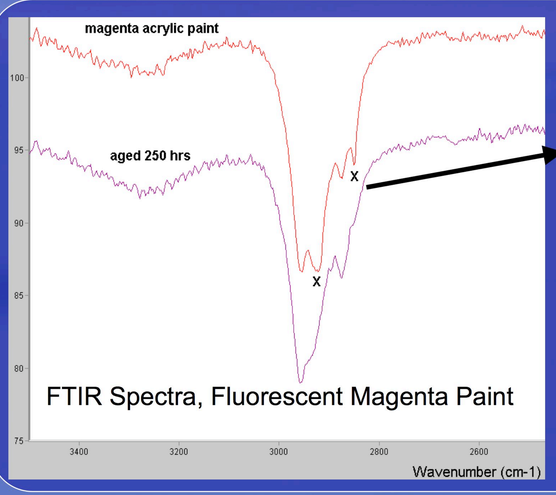


Before exposure | 250 h exposure with glazing | 250 h exposure without glazing | 250h exposure UV light image

UV-VIS Absorption Spectrometry

- less absorption in the visible range after exposure
- glazed samples tended to absorb more than unglazed samples



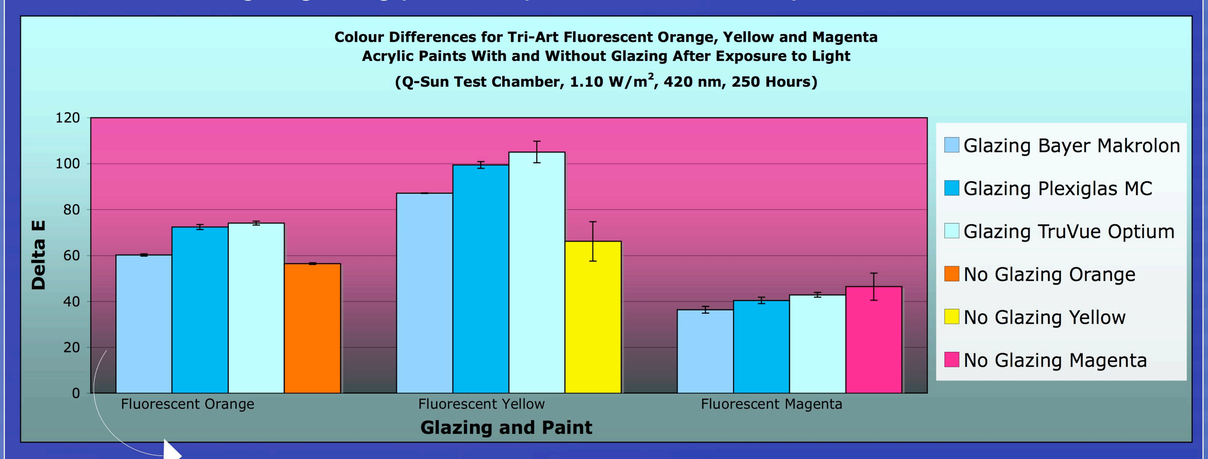


FTIR and Py/GC-MS Results

- FTIR revealed identical spectra for all samples except magenta, where a change occurred in the CH_2 groups of the acrylic polymer.
- Py/GC-MS revealed possible chemical components which could contribute to the loss of colour in the fluorescent paints.

Colorimetry

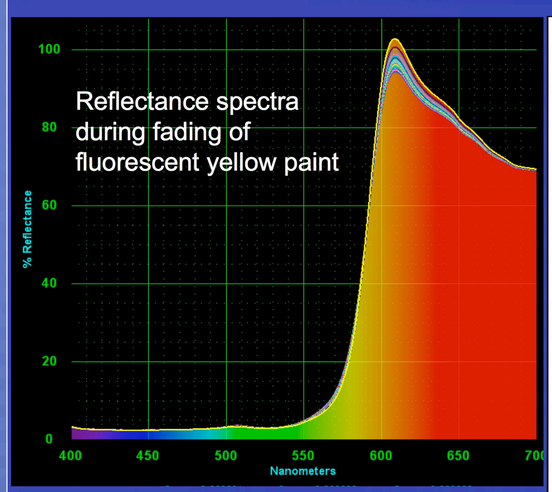
- glazed samples (yellow, orange) exhibited more colour changes than unglazed samples after 125 and 250 hours exposure to light
- in natural light, glazing provided protection to all samples

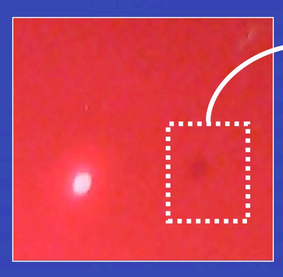


in many cases, more fading occurred with glazing!

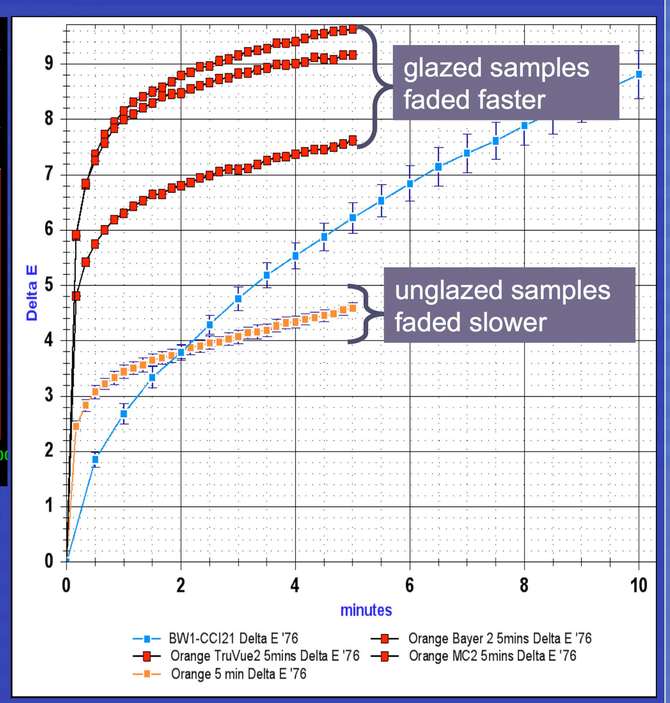
Microfading Results

- glazed orange and yellow samples faded at faster rates than unglazed samples





temporary darkening after microfading



Colour change of fluorescent orange paint with and without glazing during microfading.

Conclusions

- The results indicate a propensity for fading to occur at a quicker rate in samples with glazing than in samples without, particularly in the orange and yellow samples.
- Where ultraviolet light was present, the glazing afforded some protection to all samples, likely due to the UV protection in the glazing.
- Increases in fading rates were unexpected, and demonstrate a necessity for a closer look at glazing in museum environments.
- Future areas of research include testing with different paints (acrylic and oil), with other glazing materials, and investigations into the intensification and alteration of light by glazing materials as well as possible refraction of light and the creation of a micro-environment in which fading is favoured.

Acknowledgements: Many thanks to Conservation Scientist Season Tse, Dr. Igor Kozin, Dr. Alison Murray, Dr. Kalam Mir, Dr. Allison Rutter, Dr. HF (Gus) Shurvell, Prof. Barbara Klempan, Getty Spectral Viewer, the National Gallery of Canada, Tri-Art Paint Company, the Canadian Conservation Institute, and my fellow colleagues.