An Examination of Anoxic Color Fading for Selected Gouaches, Watercolors and Textiles

ABSTRACT

As a part of its Museum Lighting initiative, the Getty Conservation Institute explored the effects of anoxia on color fading for a wide range of colorants. Expanding upon the limited sample sets of previous research, this study attempts to further quantify the benefit and disadvantage of display in the absence of oxygen.

Following an experiment examining light-induced color fading of pigments and natural history specimens, the subsequent set focused on samples of selected gouaches, watercolors, and textiles. In addition, samples of fluorescent highlighters, ISO blue wool cards, and other fugitive pigments were included.

Samples were housed in two hermetically-sealed cases, one with an air atmosphere and the other containing less than 50 ppm of oxygen. Irradiated under a bank of MR-16 halogen lamps, temperature and relative humidity were tightly controlled by internal radiator plates connected to constant water temperature baths. The air and anoxia sets (121 samples each) were exposed for ~17.5 million lux-hours.

ΔE values (2000 calculation) were determined for each sample by pre- and post-exposure spectrophotometric analysis. The range of ΔE values observed for the air sample set ranged from 0.2 to 55, while that of the anoxia set exhibited a narrower range from 0.2 to 30. Comparing the ratio of ΔE_{Air}:ΔE_{Anoxia} for each sample, the vast majority displayed values above 1 (indicating less fading in the absence of oxygen than in air) and most of these samples showed ratios above 2 (fading in air was 2x greater than anoxic fading). However, a number of samples had ratios below 1, indicating enhanced fading in anoxia—these samples were mostly fugitive pigments, though included were gouache samples fluorescent yellow (ratio of 0.67, ~1.5x more fading in anoxia) and orange lake light (0.91) and textile samples reseda luteola on wool (0.94) and laccifer lacca on silk (0.94).

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