Exploring New Ideas for Paper Conservation Treatments Using Aqueous Solutions of Calcium Salts

ABSTRACT

Our recent work has shown that there is a beneficial effect of using dilute aqueous solutions of calcium salts in the treatment of paper objects, but that this benefit may not be long lasting, especially with oxidized papers (Bogaard and Whitmore 2001). These studies indicate that it is crucial to fully neutralize the sheet, but immersion in a strongly alkaline solution can damage an oxidized paper. A new approach to minimizing these risks while maximizing the treatment benefits was explored through chemical studies of cotton waterleaf papers. This technique utilizes the ability of the cellulose polymer to act as an ion-exchange resin. Photo-oxidized papers were immersed in a concentrated (0.1 molar) solution of calcium chloride, a neutral salt, to flush acidity out of the fibers via ion exchange. Some of the papers were then rinsed with a very dilute (0.6 millimolar) alkaline solution of calcium hydroxide. The sample sheets were evaluated for possible damage caused by the treatment, as well as for their stability in accelerated thermal aging, through measurements of degree of polymerization, carbonyl and carboxyl oxidation groups, pH, and brightness. These tests found that the treatment did not cause any significant damage to the papers, while effectively neutralizing them, and greatly slowing the deterioration upon thermal aging compared to untreated papers. However, sheets that were not rinsed after the concentrated salt treatment yellowed slightly more during thermal aging than untreated papers, despite being less deteriorated. The best result in terms of both chemical and color stability came with papers that were given a two-step treatment of immersion in the concentrated neutral salt followed by rinsing with the dilute alkaline solution.

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REFERENCE

Bogaard, John, and Paul M. Whitmore. 2001. Effects of dilute calcium washing treatments on paper. *Journal of the American Institute for Conservation* 40 (2):105–123.

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