

“SC6000 and Other Surface Coatings for Leather: Chemical Composition and Effectiveness”

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## **Introduction**

In the past few decades, little progress has been made in the field of leather conservation, and interest in new research in leather conservation is low. Today, much information available to conservators in this area comes from the leather industry itself, and the products developed for industrial purposes are not fully evaluated for use in conservation and preservation. That said, several acceptable coatings are available for use in book and leather conservation, whether they were developed for industrial purposes or other.

The field of conservation has recently adapted newer techniques for the coating of leather bindings as a measure of protection and aesthetic appearance. The much used, and older, method of treating leather with lanolin and neatsfoot oil is now avoided, as it does significant damage to the text when applied too heavily, migrating through the leather and causing staining and deterioration of the paper. Most commercially produced neatsfoot oil is made of lard, whose excess fatty acids can cause spew on the surface of the leather, while lanolin steals the skin's natural moisture (Fredericks). Coating materials in current use include Marney's Conservation Dressing, a solvent free mixture of waxes and oils, Pliantine, a beeswax and lanolin mixture, Klucel G, a hydroxyl propyl cellulose, and SC6000, an acrylic wax mixture (Haines 2). This paper aims to give characteristics of each, but will focus on the properties of SC6000.

It is important to note that in 1996, SC6000 was reformulated and replaced by SC7400 to meet British Health and Safety Standards. Since that time the new formulation has been supplied under its original name of SC6000. Practical tests on the new formulation show similar results to those done on the original formula, however, SC7400 has not been thoroughly scientifically evaluated. Because results of tests on the two products are similar, we continue to use the same name of SC6000 for the current product (Minter 189).

### **Desired characteristics of leather coatings**

In 2002, the Leather Conservation Centre published a study done by Betty Haines titled "Surface Coatings for Binding Leathers". In her introduction, Haines lists some desired characteristics for a coating, including continuous flexibility of the film over the

leather surface, firmness rather than tackiness, chemical and physical stability over time, minimum changes in color and texture of the leather, easy removability without damage to leather, and retardation of moisture permeation and pollutant penetration. Oils alone simply lubricate the leather surface, while waxes alone tend to crack and lack flexibility. For an ideal coating to be film forming and have easy removal, the choice of polymer is an acrylic over a urethane, as urethanes are irreversible. Blending an acrylic polymer with waxes will produce a surface film that is flexible and without the disadvantages of wax alone. This mix also requires polar solvents to bring the polymer into suspension for blending, which may have a negative effect on the leather depending on its method of tanning. Vegetable tanned leathers can be effected negatively in highly polar solvents, as tans can migrate to the surface of the leather causing dark staining and embrittlement (Haines 1).

Generally, conservators have observed that liquid dressings are more difficult to apply evenly and sparingly than are cream formulations. There is also a tendency for oils and dressings to darken the leather more than products designed to give a surface coating only (Haines 4). All products tested in Haines' study were deemed acceptable after testing flexibility, surface tack, permeability to water vapor and atmospheric pollutants, and pH. She emphasizes that the choice of which coating to use is still up to the book conservator, who should select a coating on the basis of ease of application and desired final appearance (Haines 14).

### **Klucel G, Pliantine, and Marney's Conservation Dressing**

#### **Test results and effectiveness**

Particular disadvantages are associated with the coatings Klucel G, Pliantine, and Marney's. Klucel G can give a dull finish and tend to break upon repeated flexing of the leather (Haines 2). Consolidants can be problematic because they usually contain polymers with molecules too large to penetrate the surface of the leather well, but Klucel G seems to be "relatively benign" as a surface consolidant when diluted properly (Fredericks).

Pliantine can give a tacky surface to the leather if applied too liberally (Haines 2), and stains the leather badly (Haines 5). In addition to the ingredients of lanolin,

cedarwood oil, and beeswax, Pliantine also contains trichloroethylene (Haines 3), a toxic solvent usually used to clean grease from metal parts (Trichloroethylene). The trichloroethylene used in the current formula replaced the problematic hexane used in the previous formula of Pliantine. The difficulty with a solvent such as hexane lies in its rapid evaporation. Before the fat/hexane mixture can penetrate the leather, the hexane evaporates to the surface, taking most of the fat with it. The other main ingredient of Pliantine, beeswax, prevents air pollutants from penetrating the leather, but does so by closing off the leather, disturbing its water balance and causing it to dry out (Guidelines).

Marney's Conservation Dressing acts more as a lubricant than a coating, and can also leave a tacky surface if not applied judiciously (Haines 3). It is difficult to apply and can darken leather, bringing out blemishes (Haines 5). Coatings like oils and dressings tend to be too viscous to penetrate the leather deeply enough, so they remain on the surface and prevent the leather from breathing. These lubricants are also prone to oxidize, leading to discoloration and hardening of the leather, and causing organic acids to be released in the leather. Lubricants used to make up for a deficiency of fat in the leather can cause "overfatting", drawing moisture out from the leather and disturbing the natural water balance (Guidelines). Lubricants alone do not provide protection against sulfur dioxide in pollutants, and can leave the surface sticky, attracting lint and dust. Most leathers are stable at an oil content of about 5% by weight, and an oil too concentrated can raise the oil content by up to 10% when applied to the leather surface, thus robbing the leather of its natural moisture content (Fredericks). "Before adding a lubricant to any leather, it is important to decide if it actually needs more flexibility, and to understand why it is stiff. If the fibers themselves are deteriorated and brittle, lubrication will not help" (Fredericks).

## **SC6000**

### **Test results and effectiveness**

SC6000 has a drawback in its application, but is otherwise an effective coating as tested so far. When the product is not applied correctly, the pattern of application can remain visible after drying (Haines 5). It should be applied in small areas at a time, and slowly, in order to give the desired result. SC6000 shows the least amount of darkening

to leather when compared to the other coatings, but does darken the surface slightly. In testing permeability to pollutants, SC6000 showed only small reduction in pH, which would mean a small increase in acid content in comparison to either no coating or other coatings. SC6000 shows effectiveness in protecting leather against water vapor transmission and acidic atmospheric pollutants (Haines 9), especially if a thicker surface coating has been applied (Haines 13). Addition of SC6000 to leather resulted in a 19-24% reduction in water transmitted, variance depending on the type of skin (Haines 8). When a solvent cleaner was applied to a leather surface coated with SC6000 and assessed microscopically, it showed complete removal of SC6000 without discoloration or damage to the grain surface of the leather (Haines 14). Haines concludes that SC6000 is an effective coating for new or undamaged leather. No other coatings tested showed any particular advantage over SC6000, and this result supports its wide use in binding and conservation. It should be noted that no acrylic coating alone can be recommended for application to scuffed or red rot areas of leather, as they will cause darkening and embrittlement, probably due to polar solvents affecting partially deteriorated leather grains (Haines 15). The label on each jar of SC6000 reads as follows:

Apply sparingly by brush or lint-free cloth onto sound leather surfaces, working in a small area at a time. The finish dries quickly and can be buffed to a shine. SC6000 is reversible in water and alcohols. Use in good ventilation. SC6000 is an effective finish for sound leather but should not be applied to fragile or flaking surfaces. It is recommended to test SC6000 in an unobtrusive area prior to use to ensure compatibility with the original finish.

The label mentions twice that SC6000 should be used only on “sound” leather. Glen Ruzicka of the Conservation Center for Art and Historic Artifacts in Philadelphia developed a possible solution for coating on fragile or flaking leather areas, called the “Red Rot Cocktail”. This mixture consists of equal parts of SC6000 and a 5% solution of Klucel G in ethanol. The mixture is easy to apply but can slightly darken the leather surface (Haines 17). It is very effective in retarding the transmission of water vapor through the surface, and gives “an aesthetically pleasing finish” (Haines 18).

## **SC6000**

### **Its history and composition**

SC6000 is a combination of natural and artificial waxes blended together with a soft acrylic resin. It was first formulated as a final top spray for the shoe industry in the late seventies and began being used for bookbindings in the early eighties. SC6000, unlike other surface coatings at the time, “gave a continuous impermeable layer which resisted the penetration of sulfur dioxide in artificial aging chambers. The material has been used since then in increasing quantities by book restorers and conservators” in Europe and particularly in the United States (Thomson).

Material Safety Data sheets for SC6000, clear selfshine cream, show that it contains up to 40% isopropyl alcohol and less than 1% of aromatic hydrocarbon. Emulsification is assisted by increasing the pH using less than 1% ammonia. Diacetone alcohol, also called DAA, is also present in less than 5% (MSDS). DAA contains both an alcohol and a ketone group, and acts as the solvent for both hydrogen bonding and polar substances (“Diacetone”). SC6000, is 22-24% solid, with a boiling point of eighty degrees Celsius and a flash point of 29 degrees Celsius. Its pH is approximately 9-9.5, and it is incompatible with strong acids, alkalis, and oxidizing agents. Hazards to health are low. Hazard to environment is that of a floating fire hazard, as SC6000 is flammable and will float on water. It may also be harmful to fish and microorganisms used for water treatment, and may not be discharged into sewers or waterways (MSDS). The only existing MSDS comes from 1994, presumably describing the original formulation rather than the newest.

### **The properties of a shoe cream**

No patent is found for SC6000, but in looking at similar patents it is seen that the term “shoe-cream” implies particular properties. Inventors of shoe-cream intend it to be a salve-like mixture of one or more different waxes and solvents. The composition may be applied easily, and after polishing should resist water. “The solvent content of the shoe cream makes possible a quick cleaning of street dirt and grime, and enables removal of spots and discolorations of all kinds.” The cream with soft wax components dissolved in solvent penetrates into the leather and provides a “secondary lubrication which is

necessary for the retention of flexibility in the leather”. After application the solvent evaporates to leave a protective, water repellent layer of wax on the surface. After polishing this results in a lustrous but thin film. These compositions have the additional advantage of temperature stability. Waxes used in shoe cream include both natural and synthetic waxes, with different melting points and densities (Muller).

The properties seen in an ideal shoe cream are also desirable in the coatings of leather used for conservation, especially continued flexibility and resistance to water permeation. Protection against soiling and a pleasant sheen and handle are also properties of an ideal coating for leather used in binding and restoration. The same is wanted for leather shoes. Perhaps this justifies the switch from shoe coating to leather coating for conservators and bookbinders.

### **Concluding thoughts**

Nearly all technical and chemical information on SC6000 is that of its first formulation, making current research on the product difficult. As mentioned before, no patent is found on either formulation and the MSDS is one that may not be exact. However, all tests with the newest formula prove the coating to be pleasing not only aesthetically, but also as a protective measure against degradation of leather by moisture and atmospheric pollutants. While commercial products can tend to change according to the market, it seems that SC6000 can be trusted for use in conservation, especially when compared to other coatings.

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## Resources for Leather Treatments and Preservatives

BookMakers  
8260 Patuxent Range Rd.  
Jessup, Maryland 20794  
[www.bookmakerscatalog.com](http://www.bookmakerscatalog.com)

Conservation Resources International  
5532 Port Royal Rd.  
Springfield, Virginia 22151  
[www.conservationresources.com](http://www.conservationresources.com)

Conservator's Emporium  
100 Standing Rock Cir.  
Reno, Nevada 89511  
[www.consemp.com](http://www.consemp.com)

J. Hewit & Sons, Ltd.  
Kinauld Leather Works  
Currie  
Edinburgh  
[www.hewit.com](http://www.hewit.com)

Leather Conservation Centre  
University College Campus  
Boughton Green Rd.  
Moulton Park  
Northampton  
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