

MANALOX® 410

Poly-oxoaluminum Stearate for Water Proofing Preparations

MANALOX 410 is a solution of poly-oxoaluminum stearate in petroleum distillates and is the active ingredient in most of the solvent based clear water repellent products sold for the treatment of wood and masonry. Although the treatment goes deep into the pores of the substrate and, when dried, prevents water from entering the pores, it does not block moisture vapor from coming through. Also, surfaces treated with MANALOX 410 based water repellent can be painted over, if that ever becomes necessary.

TYPICAL PROPERTIES

Aluminum Content	5.3%
Active Ingredient	60.0%
Flash Point (Pensky-Martens)	>141°F (61°C)
Set Point *	10°C

*As with most stearic acid derivatives, poly-oxo aluminum stearate solutions solidify upon cooling. Because MANALOX 410 is rather concentrated (60% solids), it is subject to solidification at temperatures below 10°C (50°F). When this happens in the winter, it should not be cause for alarm as it does not harm the product. Simply melt it and mix it up prior to use. Since this does add an extra production step, some users keep the material in heated warehouses for convenience.

MANALOX CHEMISTRY

Being a reactive aluminum derivative, this poly-oxo aluminum compound is capable of reacting with carboxylic acid groups, hydroxyl groups and with water. Since the reaction with water produces the dihydroxy aluminum stearate, the chemical can be thought of as 'anhydrous aluminum stearate'. The fully reacted aluminum stearate would be difficult to dissolve in petroleum distillates because of the tendency of all fatty aluminum salts (or aluminum soaps, as they are called) to gel organic solvents. The poly-oxo form, on the other hand, is readily soluble in organic liquids and, as such, can be soaked into the pores of the substrate with the solvent. Then when the solvent leaves, the material reacts with the small amount of moisture found in wood and masonry and converts to the aluminum stearate deep inside the substrate. This deep penetration accounts for the excellent dimensional stability that MANALOX 410 gives to wood.

FORMULATING

Although a simple solvent dilution of MANALOX 410 can make an effective water repellent product with excellent dimensional stability properties, performance is enhanced by adding certain resins and waxes to improve the water beading effect of the formulation. Water beading is a cosmetic effect that gives the user a feeling of protection. Wax by itself can provide an excellent beading effect, but offers virtually no dimensional stability properties to wood. The combination of MANALOX 410 with additives that improve water beading results in a product that not only looks good, but protects the wood as well. Long after the water beading has disappeared, the MANALOX continues to protect the wood from water absorption.

When choosing additives, one must remember the reactive nature of the poly-oxo aluminum compound. For example, resins that have carboxyl groups should be avoided because they will react and may cause thickening or even gellation of the formulation. Likewise, alcohol or other hydroxyl containing products and water can cause similar problems.

Both non reactive hydrocarbon resins and paraffin wax are good choices for additives in MANALOX 410 based water repellents. Both are inert toward the oxo-aluminum compound and both products enhance the water beading properties of the treated substrates. Care should be taken when choosing the wax component. Paraffin waxes are preferred to microcrystalline waxes because of their better solubility in mineral spirits.

Alkali refined linseed oil can be used in place of the hydrocarbon resins; however, care must be taken on the choice of the oil grade. A high quality grade with an Acid Value less than 1.0 should be chosen to avoid the possibility of thickening or gellation of the formula.

In the suggested formula below, either of the Exxon hydrocarbon resins can be used to obtain approximately the same performance results. The Escorez 5300 resin is lighter in color, but higher in price.

The following formulation shows excellent beading properties and passes the federal specification TT-W-572b for swelling of wood:

SUGGESTED FORMULA #1

<u>Product</u>	<u>Percent</u>
Odorless Mineral Spirits ¹	82.2
MANALOX 410	7.0
Hydrocarbon Resin ²	6.1
Paraffin Wax ³	4.7
	<hr/> 100.0

¹ Exxsol D60, Exxon Corp. or Shell D60, Shell Chemicals

² Escorez 5300 or Escorez 2393, Exxon Chemical Company

³ 1236 Wax, MP 132°F (55°C), IGI Boler, Inc.; Wayne, PA

LOW VOC COMPOSITIONS

Typical solvent based waterproofing compositions, in the past (such as the previously suggested formula #1), have been 10 - 15% solids (resins, waxes, stearates, etc.) in a volatile solvent such as mineral spirits. Since these materials do not meet the new VOC regulations, work has been done to modify the solvent system so that they can be in compliance. Linseed oil can be substituted for some of the mineral spirits, but it is particularly prone to mildew attack, and may also necessitate the use of a cobalt drier to speed up the dry time. A less expensive approach is to use a low viscosity, high boiling point solvent which absorbs into the wood surface in a similar manner to lithographic printing ink solvents which are designed to absorb into the paper rather than evaporate. The Starting formula below utilizes this type of solvent mixed with regular mineral spirits.

SUGGESTED LOW VOC FORMULA

<u>Product</u>	<u>Percent (Weight)</u>
Odorless Mineral Spirits ¹	45.8
High BP Ink Oil ²	36.6
Manalox® 410 ³	7.0
Hydrocarbon Resin ⁴	6.0
Paraffin Wax ⁵	4.6
	<hr/>
	100.0

Test Results

VOC (ASTM D2369)	566 g/L
Swell Efficiency (ASTM D4446)	Passes

¹ Exxsol D60, Exxon Corp.

² Magiesol 60, Magie Bros. Oil Company, Franklin Park, IL.

³ FedChem LLC

⁴ Escorez 2393, Exxon Chemical Company

⁵ Boler 1230 (52°C MP), IGI Boler, Inc. Wayne, PA

TEST DATA

PONDEROSA PINE

Five wood samples were treated with the test formulation based on MANALOX 410 and allowed to dry for three days. After this conditioning, all five plus an untreated control were weighed and then submerged in water for 30 minutes. After removal from the soaking all samples were blotted with paper towels to remove surface water and reweighed to determine percent water absorption.

<u>Treatment</u>	<u>% Water Absorbed</u>
Untreated	53.2
Treated	8.1

BRICK

In the following test, bricks were treated by painting a MANALOX 410 formulation on the surfaces with a 2" paint brush and allowed to air dry to a constant weight. They were then placed in 1/2" of water and taken out and weighed at intervals to determine % water absorption.

<u>Hours</u>	<u>Untreated brick</u>	<u>Treated brick</u>
1	50.2	0.076
3	63.8	0.160
5	64.1	0.198
24	64.8	0.211
48	65.2	0.211
72	66.7	0.211
96	67.2	0.211

DURABILITY

All clear coatings and water proofing treatments have a limited life on wood due to the action of light and the dimension changes caused by temperature and moisture. Wood substrates treated with MANALOX 410 are protected from large changes due to moisture, but even small amounts of water absorbed and evaporated will eventually cause some deterioration of the wood. For this reason, it is recommended that wood substrates be treated annually for best lasting results.

Masonry, on the other hand, is inherently more stable to dimension changes and, therefore, MANALOX 410 based products applied to masonry hold their water repellent properties much longer than they do on wood. In England, where the climate is particularly damp and buildings are generally constructed of solid masonry, MANALOX 410 based waterproofing compounds have long been recognized for their longevity as damp proofing treatments for stone and brick walls.

In order to establish the long term durability of Manalox based water repellents on masonry, the British Agrément Board conducted a ten year test for certification. A wall was constructed consisting of sections of three types of brick and two types of limestone. It was divided vertically into equal sections, one of which was treated with a MANALOX 410 solution and the other left untreated. Annual testing was carried out by the Agrément Board, and after ten years exposure the Manalox treated section still showed no sign of allowing water penetration and appeared to be less affected by atmospheric pollution than the untreated section. The Agrément Board is an independent testing agency sponsored by the British government.

02/07