

with Polyethylene Glycol (PEG)¹

Preventing Cracking of High-value Wood

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Polyethylene glycol (PEG) is useful for preventing checks and cracks in wood with high value uses. Wood pieces such as carvings, novelties, cross section disks and gunstocks are especially suited for this treatment since normal kiln drying of the wood can be eliminated.

Limitation

Wood treatment with PEG is preferable on green wood prior to drying. It should be noted that the only finish found to be completely satisfactory for coating PEG treated wood is a moisture-cure-type of polyurethane resin varnish. Since the PEG is water soluble it will leach out of the wood, and exterior uses with exposure to water are not recommended.

Method

Wood heavily treated with PEG retains its turgid (green) dimension indefinitely; thus the wood is permanently restrained from shrinking, swelling, or warping regardless of atmospheric humidity. For maximum dimensional stability, PEG must be diffused into the wood in amounts of 25 to 30 percent of the dry weight of the wood.

The two solutions commonly used are 30 and 50 percent PEG by weight. Exactly 4.46 pounds of polyethylene glycol-1000 dissolved in 5 quarts of water yields 7 quarts of 30 percent solution with a specific gravity of 1.05 at 60°F. Ten pounds of polyethylene glycol dissolved in an equal weight of water (about 4.8 quarts) yields about 7.4 quarts of 50 percent solution with a specific gravity of 1.093 at 60°F. A precision hydrometer accurate for the desired range of specific gravities will help maintain the proper concentration of the solution during treatment.

¹Condensed from "How PEG Helps the Hobbyist Who Works With Wood," by H. L. Mitchell. 1972. U.S. Forest Products Laboratory, Madison, WI.

PEG does not volatilize at the temperatures normally used in treating vats, but water does evaporate during long treating cycles, even in covered (but not airtight) vats. Accordingly, it is usually necessary to replace water lost by evaporation before more chemical must be added to make up for that diffused into the wood during treatment.

Glass, earthenware, plastic, or similar types of containers are adequate for treating a limited amount of wood. A plastic trash container is an excellent treating vat for a cross section (disk) of wood. Metals, except certain types of stainless steel, should not be used because they react with extractives from the wood and form compounds that discolor the wood and the solution.

Simple Vat

A serviceable, one-time treating vat can be made from a fiberboard box lined with a heavy polyethylene bag or sheet. Cross sections of logs up to 60 inches in diameter have been successfully treated in circular vats roughly fashioned from scrap lumber or plywood and lined with a sheet of heavy plastic. Two plastic sheets should be used to provide a safety margin and prevent loss of solution.

After the disk is placed in the vat, it should be supported by a few narrow strips of wood to permit free circulation of the solution beneath it. And, it should be weighted down with a non-metal weight to assure complete immersion. Stones or bricks can be nested in irregular or empty spaces around a large disk to raise the solution level and reduce the amount of solution needed for complete immersion.

Growth of molds, bacteria, and fungi during long treatment can be prevented by adding borax or sodium pentachlorophenolate to the PEG solution, at a 1 to 2 percent concentration.

PEG solutions can be re-used indefinitely by adding chemical (or water) to maintain it at the desired concentration. When not in use, they should be stored in glass containers.

Hobbyists and small commercial users of PEG usually construct 50- to 100-gallon-capacity treating vats of 1/2-inch exterior-grade Douglas-fir plywood glued together with resorcinol or some equally water-resistant adhesive. This type of tank is frequently lined with fiberglass and polyester resin, the kind used to cover wooden boats.

For best results, treating tanks should be equipped with electric heating elements (with built-in thermostat) of the type used in water heaters. It is desirable to cover the sides, bottom, and especially the cover, with fiberglass insulation (4 inch) to conserve heat. In a production operation, the PEG solution is normally circulated periodically with a pump system activated by a cycle timer. Brass or copper pipe fittings are not objectionable if they are always completely covered by the solution.

Commercial operators who treat with PEG frequently use stainless steel vats similar to those used by the dairy and food-processing industries.

The following treating schedules are based on experience with walnut:

FIGURE 1. A Walnut cross section wood disk treated with Polyethylene Glycol (PEG) to prevent checks and cracks.



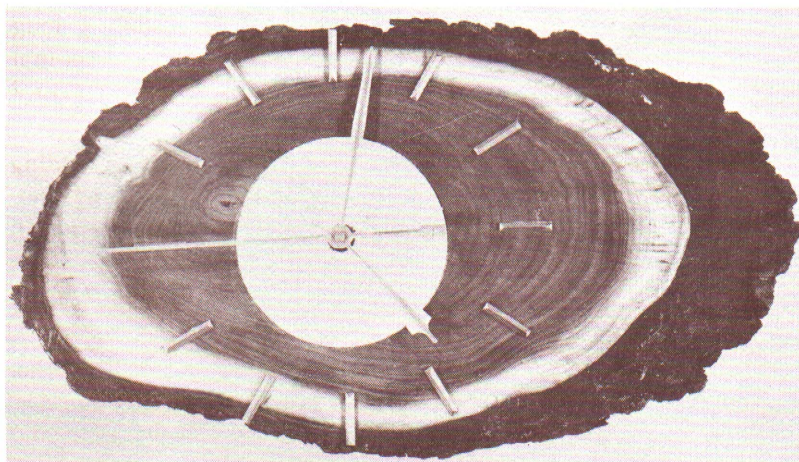


FIGURE 2. A bias cross section cut from a walnut limb, treated with polyethylene glycol to prevent cracks. The back side was routed to house clock works.

Suggested period of soak for walnut disks—

Solution Concentration and Temperature	Up to 9 inches in diameter and 1 to 1-1/2 inches thick (Days)	More than 9 inches in diameter and 2 to 32 inches thick (Days)
30 percent, 70°F	20	60
50 percent, 70°F	15	45
30 percent, 140°F	7	30
50 percent, 140°F	3	14

For drying, pile the treated disks and use separators between layers and place them under a cover in a well-ventilated room or building, preferably a room heated in winter. Time needed for air-drying will vary with thickness of disks, temperature, and relative humidity. Treated cross sections up to 4 inches thick and 40 inches in diameter will dry sufficiently for finishing if placed 6 to 8 weeks in a heated room in winter. Thinner, smaller disks will dry much faster in a similar environment. Stored outdoors in the summer, even under cover, drying takes somewhat longer than in a heated room. However, since treated disks shrink very little during drying, it is not essential that they be completely or uniformly dry before work on them is started. It is only necessary that the surface 1/4 inch be sufficiently dry to sand well and accept the finish.

Partial List of Commercial Suppliers of PEG in Small Quantities

Robert M. Albrecht 8635 Yolanda Avenue Northridge, CA 91324	Wilken-Anderson Company 4525 West Division St. Chicago, IL 60651
Crane Creek Company Post Office Box 5553 Madison, WI 53705	

Partial List of Suppliers of Polyurethane Resin Coatings

Crane Creek Gun Stock Company Waseca, MN 56093
Furane Plastics, Inc. 4516 Brazil Street Los Angeles, CA 90039
Schenectady Resins Division Schenectady Varnish Company Post Office Box 1046 Schenectady, NY 12301
Pittsburgh Plate Glass Company Springdale, PA 15144
Glidden Company 900 Union Commerce Building Cleveland, OH 44114
Trancoa Chemical Corporation Reading, MA 01867

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