

TECHNICAL NOTE NUMBER 253

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOREST PRODUCTS LABORATORY

MADISON 5, WISCONSIN

REVISED

June 1954

COLOR TESTS FOR DIFFERENTIATING HEARTWOOD AND SAPWOOD OF CERTAIN OAKS, PINES, AND DOUGLAS-FIR

Three chemical color tests have been developed by which sapwood and heartwood of certain oaks, pines, and Douglas-fir can be readily differentiated. They consist of the application of a small amount of chemical solution across the grain of the wood. The chemical used depends upon the kind of wood to be tested.

Test for Oaks

Two chemical solutions can be used to distinguish heartwood from sapwood in oak. One is Taylor's concentrated Benzo Yellow pH indicator, a chemical used for making acidity tests. Its reaction to the more acid heartwood and to the less acid sapwood produces the characteristic color differentiation. The heartwood stains red and the sapwood yellow. A minute or longer may be required for the full development of color. Occasionally the red heartwood color occurs mainly in the wood rays, and in such cases a hand lens will aid in observing it.

A 0.1 percent solution of methyl orange in water works the same way. Methyl orange is more easily obtained than Benzo Yellow.

The chemicals have been found to give generally good results with Oregon white oak, white oak, chestnut oak, swamp chestnut oak, northern red oak, black oak, scarlet oak, and roble (Quercus copeyensis), a Costa Rican species of oak. They are apparently about equally effective on green and on seasoned wood. Indefinite or erratic results may be obtained, however, when they are applied to wood treated with preservative chemicals, to wood exposed to long weathering, or to wood infected by stain or decay fungi, molds, or the organisms present in "sour" logs. Consequently, the test is not recommended for use under any of these conditions.

Test for Pines

The boundary between heartwood and sapwood is frequently difficult to recognize with certainty in the pines. A chemical solution found to be effective in distinguishing one from the other in southern yellow pine, lodgepole pine, and red pine, and which gives fairly good results with western white pine, sugar pine, and ponderosa pine as well, can be made as follows:

Dissolve 5 grams of benzidine in 23 cubic centimeters of 25 percent hydrochloric acid and 970 cubic centimeters of water. (NOTE: Concentrated chemically pure hydrochloric acid contains about 38 percent of the acid; to make a 25 percent solution, pour out 25 cubic centimeters of chemically pure concentrated acid and add to it enough water to make 38 cubic centimeters of liquid.)

Next, prepare a 10 percent solution of sodium nitrite.

When ready to make tests on wood, mix the two prepared solutions in equal amounts. When the mixture is applied to the wood, color reaction takes place in a few moments, the sapwood appearing yellowish brown and the heartwood red.

The mixture does not produce useful colorations on beech, oak, larch, the spruces, Douglas-fir, or the true firs.

Test for Douglas-fir

The heartwood and sapwood of Douglas-fir can usually be differentiated with a 0.75 percent water solution of sodium alizarine-sulfate (Alizarine Red S; Alizarine carmine). This indicator, which changes color in the pH range of about 3.7 to 5.2, stains the heartwood and one or two adjacent annual rings in the sapwood yellow and the sapwood pink, or some other shade of red. The indicator works on both dry and green wood, and the colors are comparatively permanent. The test works best on a freshly exposed surface. A little alcohol added to the solution will make it wet dry wood more rapidly.