



# Standard Test Methods for Water Solubility of Wood<sup>1</sup>

This standard is issued under the fixed designation D1110; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 These test methods<sup>2</sup> cover the determination of the water solubility of wood. Two methods are given, as follows:

1.1.1 *Method A—Cold-Water Solubility*—This method provides a measure of the tannins, gums, sugars, and coloring matter in the wood.

1.1.2 *Method B—Hot-Water Solubility*—This method provides a measure of the tannins, gums, sugars, coloring matter, and starches in the wood.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Significance and Use

2.1 Cold water removes a part of such extraneous materials as tannins, gums, sugars, and coloring matters. Hot water removes these *plus* the starches.

### METHOD A—COLD-WATER SOLUBILITY

## 3. Apparatus

3.1 *Filtering Crucibles*—Alundum or fritted-glass crucibles of coarse porosity will be required.

3.2 *Filtering Flask*—A suction filtering flask, equipped with a rubber flange for the crucible and funnel, shall be provided.

## 4. Test Specimen

4.1 The test specimen shall consist of 2 g of air-dried sawdust that has been ground to pass a 425- $\mu$ m sieve and be retained on a 250- $\mu$ m sieve.

<sup>1</sup> These test methods are under the jurisdiction of ASTM Committee D07 on Wood and are the direct responsibility of D07.01 on Fundamental Test Methods and Properties.

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<sup>2</sup> For further information on these test methods, the following references may be consulted:

Schorger, A. W., "Chemistry of Cellulose and Woods," 1926, p. 506, McGraw-Hill, NY.

Hawley and Wise, "Chemistry of Wood," 1926, p. 134, Chemical Catalog Co., NY.

## 5. Procedure

5.1 Place a 2-g test specimen, the moisture content of which has been previously determined, in a 400-mL beaker, and cover with 300 mL of distilled water. Let this mixture digest at a temperature of  $23 \pm 2^\circ\text{C}$ , with frequent stirring, for 48 h.

5.2 Filter the material on an Alundum or fritted-glass crucible, using suction, wash with cold distilled water, and dry to constant weight at 100 to 105°C. Drying usually requires approximately 4 h. Place the crucible in a loosely stoppered weighing bottle, cool in a desiccator, and weigh.

## 6. Report

6.1 Report the results as percentage of matter soluble in cold water, on the moisture-free basis, calculated as follows:

$$\text{Cold water solubility, \%} = [(W_1 - W_2)/W_1] \times 100 \quad (1)$$

where:

$W_1$  = weight of moisture-free specimen used in 5.1, and  
 $W_2$  = weight of dried specimen after extraction with cold water (5.2).

### METHOD B—HOT-WATER SOLUBILITY

## 7. Apparatus

7.1 *Digestion Apparatus*—A 200-mL Erlenmeyer flask provided with a reflux condenser shall be used.

7.2 *Water Bath*, so constructed that the water can be maintained at boiling temperature and at a constant-level just above the solution in the flask.

7.3 *Filtering Crucible and Filtering Flask*—See Section 3.

## 8. Test Specimen

8.1 See Section 4.

## 9. Procedure

9.1 Place a 2-g test specimen, the moisture content of which has been previously determined, and 100 mL of distilled water in the Erlenmeyer flask and attach the reflux condenser. Place the flask in the boiling water bath, with the solution in the flask just below the level of the water in the bath, and heat gently for 3 h.

9.2 Filter the contents of the flask on a tared Alundum or fritted-glass crucible, using suction, wash with hot water, and dry to constant weight at 100 to 105°C. Place the crucible in a loosely stoppered weighing bottle, cool in a desiccator, and weigh.

## 10. Report

10.1 Report the results as percentage of matter soluble in hot water, on the moisture-free basis, calculated as follows:

$$\text{Hot water solubility, \%} = [(W_1 - W_2)/W_1] \times 100 \quad (2)$$

where:

$W_1$  = weight of moisture-free specimen used in 9.1, and  
 $W_2$  = weight of dried specimen after extraction with hot water (9.2).

## 11. Precision and Bias<sup>3</sup>

11.1 All data obtained in one laboratory by testing 20 woods.

	Repeatability, as Solubility, %	Repeatability, % of Solubility
Cold (1.1 to 6.3 %)	0.14	5.7
Hot (1.6 to 9.0 %)	0.15	3.8

11.2 Reproducibility and bias are unknown.

## 12. Keywords

12.1 cold water solubility; hot water solubility; water solubility

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<sup>3</sup> Data in this section obtained from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.

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