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## Pentosans in wood and pulp

### 1. Scope

This method for determination of pentosan content can be applied to both wood and to unbleached or bleached pulps.

### 2. Summary

Pentosans are transformed in boiling 3.85*N* hydrochloric acid to furfural, which is collected in the distillate and determined colorimetrically with orcinol-ferric chloride reagent.

**NOTE 1:** Hydroxymethyl-furfural formed from hexoses does not interfere in this determination (1).

### 3. Significance

3.1 Wood contains a certain amount of noncellulosic carbohydrates called hemicellulose. Softwood hemicellulose consists of both pentosans and hexosans; hardwood hemicellulose consists mainly of pentosans. Pentosan content in softwoods is about 7 to 10%, and in hardwoods about 19 to 25%.

3.2 Pentosan content in pulp indicates the retention or loss of hemicellulose in general during pulping and bleaching processes, and since hemicellulose contributes to the strength of paper pulps, high pentosan content is desirable. In dissolving pulps, particularly acetate pulps, pentosan content should be kept low.

### 4. Apparatus

4.1 *Distillation apparatus*, as illustrated in Fig. 1, consisting of a boiling flask, a graduated separatory funnel, Graham-type condenser, a volumetric flask (with marks added at 25-mL intervals), and two- and three-way connecting tubes. All connections of the apparatus are 24/40 ground glass joints.

4.2 *Heater*, electric, with temperature control, for use with boiling flask.

4.3 *Ice bath*, a beaker or dish with crushed ice into which volumetric receiving flask is immersed.

4.4 *Spectrophotometer or filter colorimeter*, for measuring light absorbance at 630 nm, with matched glass

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cells or cuvettes.

- 4.5 *Constant temperature bath*, to maintain a temperature of  $25 \pm 1^\circ\text{C}$ .
- 4.6 *Timer*, or stopwatch.
- 4.7 *Other glassware*: volumetric flasks, 50-mL; pipets, 5-mL and 25-mL.

## 5. Reagents and materials

5.1 *Hydrochloric acid*,  $3.85 \pm 0.05\text{N}$  HCl (13.15%). Dilute 315 mL of concentrated HCl (sp gr 1.18- 1.19) with water to 1000 mL. Determine the normality of the HCl by titration with 1.0N standardized sodium hydroxide solution whose normality is known to  $\pm 0.01\text{N}$ .

5.2 *Orcinol reagent*. Dissolve 0.400 g of orcinol,  $\text{CH}_3\text{C}_6\text{H}_3(\text{OH})_2$ , and 0.500 g of ferric chloride,  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , in 1000 mL of 11N hydrochloric acid (prepared by diluting 915 mL of concentrated HCl to 1000 mL). Store the reagent in a refrigerator and discard it if more than two weeks old.

5.3 *Sodium chloride*, NaCl crystals.

5.4 *Ethanol*, 95%,  $\text{C}_2\text{H}_5\text{OH}$ , aldehyde free. Ethanol denatured with methanol (Formula 30) may be used.

5.5 *Xylose*,  $\text{C}_5\text{H}_{10}\text{O}_5$ , reagent grade.

5.6 *Crushed ice*.

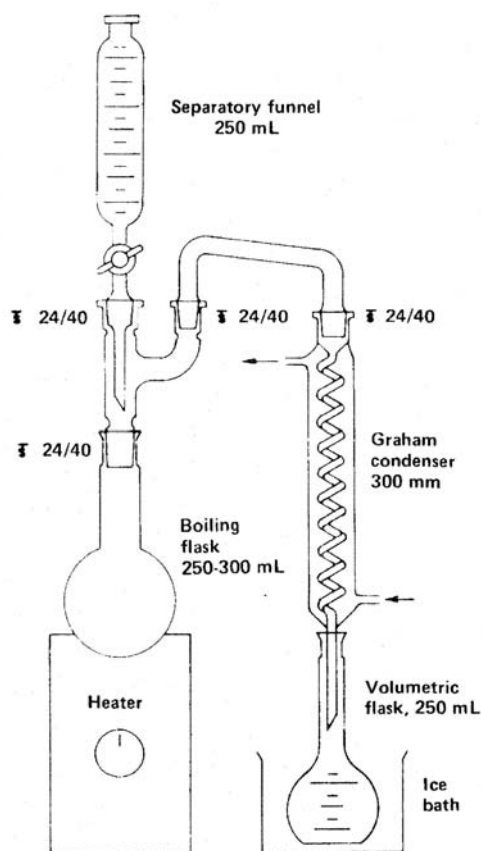


Fig. 1. Distillation apparatus

## 6. Sampling

6.1 For wood, obtain a sample and prepare 3 to 5 g of extractive-free wood in accordance with TAPPI T 257 "Sampling and Preparing Wood for Analysis" and TAPPI T 263 "Identification of Wood and Fibers from Conifers."

6.2 For pulp, obtain a sample, equivalent to 5 to 10 g oven-dry, in accordance with a predetermined sampling procedure.