
Application Bulletin

Of interest to: Paper industry, print shops

A 13

Determining the pH value of paper

Summary

Two electrometric methods for determining the pH value of papers with homogeneous and heterogeneous pH cross-sections are described.

A) Paper with homogeneous pH cross-section (extraction method)

This method is used for papers made in one single process that have not been subjected to any subsequent conversion process such as coating.

Instruments and accessories

- 744 (or 704 or 713) pH Meter
 - 6.0239.100 combined pH electrode with ground-joint diaphragm
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Reagents

- Freshly boiled distilled water (pH = 6.8 ... 7.2)
 - Buffer solutions for calibrating the pH meter, e.g. Metrohm buffer pH = 7.00 (6.2307.110) and pH = 4.00 (6.2307.100)
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Analysis

Cold extraction

Stir up 5 g paper in 50 mL distilled water in a 250 mL beaker and then add a further 50 mL distilled water. Leave the beaker standing for 1 h at room temperature with a watch glass over it.

After calibrating the pH meter, immerse the pH electrode in the aqueous paper suspension and read off the pH value.

Hot extraction

Put 5 g paper in 100 mL distilled water in a 250 mL round-bottomed flask with standard ground joint. Fit a reflux condenser and extract at 95 °C for 1 h in a boiling water bath.

When the solution has cooled off, measure the pH as described under «cold extraction».

Remark

Take care only to use high-grade distilled water for these measurements.

B) Paper with heterogeneous pH cross-section (surface measurement)

This refers to coated papers. The method gives only the surface pH, which is the important value where printability is concerned. Investigations and experience have both shown that printing occurs so quickly that any reaction with the ink only occurs in the surface coating of the paper.

Instruments and accessories

- 744 (or 704 or 713) pH Meter
 - 6.0227.100 combined flat membrane pH electrode
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Reagents

- Freshly boiled distilled water (pH = 6.8 ... 7.2)
 - Buffer solutions for calibrating the pH meter, e.g. Metrohm buffer pH = 7.00 (6.2307.110) and pH = 4.00 (6.2307.100)
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Analysis

Cut out a paper sample of 5 cm x 5 cm. After calibrating the pH meter, drop 0.1 mL distilled water on the surface of the sample. Apply the flat membrane electrode to the damp area of the paper and rub the surface of the coating lightly with it. Then switch the pH meter to «measure». As soon as the value is stable on the display (after approx. 30 s), read off the pH value.

Remarks

- Take care only to use high-grade distilled water for these measurements.
 - Coated papers give different results with the extraction and surface methods, since extraction gives an average value for the whole paper, while surface measurements give only the pH value of the coating.
 - Surface measurements can be affected by moisture stabilizers, variations in coating thickness, and the type of sizing, among other things.
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Literature

- EMPA St. Gallen
Bestimmung des pH-Wertes eines wässrigen Papierauszugs C 3011
- O. Huber
Messung von pH-Werten an der Papieroberfläche
Das Papier 2 (1964) 45–53
- ASTM Method D-778
- DIN Method 53124