

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 173

iTeh **STANDARD PREVIEW** PLASTICS

DETERMINATION OF THE PERCENTAGE OF STYRENE IN POLYSTYRENE WITH WIJS SOLUTION

[ISO/R 173:1961](https://standards.iteh.ai/catalog/standards/sist/7d8dcba0-444b-4705-9773-56f2be04a942/iso-r-173-1961)

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BRIEF HISTORY

The ISO Recommendation R 173, *Determination of the Percentage of Styrene in Polystyrene with Wijs Solution*, was drawn up by Technical Committee ISO/TC 61, *Plastics*, the Secretariat of which is held by the American Standards Association, Incorporated (ASA).

Work on this matter which the Technical Committee had begun since 1954, came to an end in 1956, with the adoption of a proposal as a Draft ISO Recommendation.

On 28 November 1958, the Draft ISO Recommendation (No. 188) was distributed to all the ISO Member Bodies and was approved, subject to some editorial amendments, by the following Member Bodies:

Australia	Hungary	Romania
Austria	India	Spain
Belgium	Israel	Sweden
Bulgaria	Italy	Switzerland
Burma	Japan	Turkey
Czechoslovakia	Netherlands	United Kingdom
France	Poland	U.S.A.
Germany	Portugal	U.S.S.R.

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1961, to accept it as an ISO RECOMMENDATION.

PLASTICS

DETERMINATION OF THE PERCENTAGE OF STYRENE
IN POLYSTYRENE WITH WIJS SOLUTION

1. SCOPE

The purpose of this ISO Recommendation is to describe a procedure for determining the percentage of monomeric styrene and other unsaturated compounds in unmodified polystyrene by measuring the degree of unsaturation of polystyrene with iodine monochloride, the results being expressed as monomeric styrene.

The test supplements the method for the determination of percentage methanol soluble matter of polystyrene, as it usually shows whether a high value of methanol soluble matter is due to a high styrene content or to the presence of substances other than styrene, e.g. lubricant.

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2. APPARATUS
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The apparatus consists of the following:

- 2.1 Means of reducing the material to a powder.
- 2.2 Sieve with apertures 1.5 to 2.0 mm square.
- 2.3 Graduated flask, 250 ml.
- 2.4 Bottle, glass-stoppered, of about 500 ml capacity.
- 2.5 Balance to weigh to 0.001 g.

3. REAGENTS

The following reagents are required:

- 3.1 Potassium iodide, 10 per cent solution, free from iodates.
- 3.2 Sodium thiosulphate solution, approximately 0.1N.
- 3.3 Starch solution, 1 per cent.
- 3.4 Carbon tetrachloride.
- 3.5 Wijs solution, prepared by dissolving 8 ± 1 g of iodine trichloride and 9 ± 0.1 g of iodine in a mixture of 300 ml of carbon tetrachloride and 700 ml of glacial acetic acid. Iodine monochloride may be used in place of iodine trichloride.

The solution, which should be of a dark colour, is then filtered and stored in a dark cupboard. It should not be used within three days of its preparation.

4. PREPARATION OF SAMPLE

A fully representative sample should be used. If necessary to facilitate solution, the sample may be ground by any convenient means so that it will pass through a sieve with apertures 1.5 to 2.0 mm square.

5. PROCEDURE

Two portions of the material should be tested.

- 5.1 For each portion, weigh approximately 10 g of the sample of polystyrene to the nearest 0.01 g into a 250 ml graduated flask and add 150 to 200 ml of carbon tetrachloride. The solution is allowed to stand until the polystyrene is almost dissolved and the dissolution is completed by shaking. Carbon tetrachloride is then added to make the volume of the solution up to 250 ml and the whole well mixed.
- 5.2 Transfer 50 ml of the solution to a clean dry bottle of about 500 ml capacity provided with a well-fitting glass stopper. Add 10 ml of Wijs solution, prepared as described herein, and seal the bottle effectively with a stopper moistened with potassium iodide solution. The bottle is allowed to stand in the dark at a temperature of 15 to 20 °C for 15 minutes. Then, add 15 ml of 10 per cent solution of potassium iodide and 100 ml of distilled water, care being taken to avoid loss of iodine vapour. The contents of the bottle are shaken and then titrated with approximately 0.1N sodium thiosulphate solution, starch solution being added as indicator towards the end of the titration.
- 5.3 A blank determination should be made upon the same quantities of reagents at the same time and under the same conditions. It is essential that the Wijs solution used in the test and in the blank determination should be at the same temperature.

6. CALCULATION AND EXPRESSION OF RESULTS

The percentage of styrene is calculated as follows:

$$\text{Styrene, per cent} = \frac{0.052 \times 5 m (V_1 - V_2)}{0.127 M} 100 = \frac{205 m (V_1 - V_2)}{M}$$

where M = mass, in grammes, of polystyrene used to make 250 ml of the polystyrene solution;

V_1 = volume, in millilitres, of the sodium thiosulphate solution used in blank titration;

V_2 = volume, in millilitres, of the sodium thiosulphate solution used in titration with polystyrene solution;

m = mass, in grammes, of iodine equivalent to 1 ml of the sodium thiosulphate solution.

The percentage of styrene in the material under test is the arithmetic mean of the two determinations.