

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 489

PLASTICS

### DETERMINATION OF THE REFRACTIVE INDEX OF TRANSPARENT PLASTICS

1st EDITION

July 1966

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## BRIEF HISTORY

The ISO Recommendation R 489, *Plastics — Determination of the Refractive Index of Transparent Plastics*, was drawn up by Technical Committee ISO/TC 61, *Plastics*, the Secretariat of which is held by the American Standards Association, Inc. (ASA).

Work on this question by the Technical Committee began in 1959 and led, in 1962, to the adoption of a Draft ISO Recommendation.

In June 1963, this Draft ISO Recommendation (No. 582) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies:

|                |                          |                |
|----------------|--------------------------|----------------|
| Argentina      | Hungary                  | Romania        |
| Australia      | India                    | Spain          |
| Austria        | Italy                    | Sweden         |
| Belgium        | Japan                    | Switzerland    |
| Chile          | Netherlands              | United Kingdom |
| Czechoslovakia | New Zealand              | U.S.A.         |
| Finland        | Poland                   | U.S.S.R.       |
| France         | Portugal                 | Yugoslavia     |
| Germany        | Republic of South Africa |                |

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 July 1966, to accept it as an ISO RECOMMENDATION.

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## PLASTICS

DETERMINATION OF THE REFRACTIVE INDEX  
OF TRANSPARENT PLASTICS

## 1. SCOPE

- 1.1 This ISO Recommendation describes two methods of test for determining the refractive index of transparent plastics:

*Method A. Refractometric method* for measuring the refractive index of transparent cast, moulded or sheet materials by means of a refractometer. The method is recommended when great accuracy is required. It cannot be used for powdered or granulated transparent materials.

*Method B. Immersion method (Becke line phenomenon)* for determining the refractive index of powdered or granulated transparent materials by means of a microscope and making use of the Becke line phenomenon. Monochromatic light should, in general, be used to avoid dispersion effects. The accuracy of this method is about the same as that of method A.

- 1.2 *Refractive index* is a fundamental property which can be used for the control of purity and composition, for the identification of materials and for the design of optical parts.

The change of refractive index with temperature may give an indication of transition points of materials.

## 2. APPARATUS AND CHEMICALS

## 2.1 Method A

- (a) *Abbe refractometer* or any other refractometer that can be shown to give the same results.
- (b) *Source of white light*.
- (c) *Contacting liquid* (see Note 1).

## 2.2 Method B

- (a) Microscope having a magnifying power of at least 200 diameters, an 8 mm objective of good quality, and a centring substage condenser capable of being stopped down to a very narrow axial beam.
- (b) Immersion liquids with different refractive indices (see Note 2).

### 3. PREPARATION OF TEST SPECIMENS

#### 3.1 Method A

The test specimens cut from the sample should be of such a size as will fit on the face of the fixed half of the refractometer prisms.

The following dimensions are convenient:

6 mm wide  
12 mm long  
3 mm thick

For maximum accuracy the surface of the test specimen in contact with the prism should be quite flat and well polished. Satisfactory contact between the test specimen and the prism is indicated by the dividing line between the light and dark halves of the eyepiece field appearing sharp and straight. A second surface with a fair polish is prepared perpendicular to the first and on one end of the test specimen.

These two polished surfaces should intersect along a sharp line without a bevelled or rounded edge.

For anisotropic materials, see Note 3.

#### 3.2 Method B

The sample consists of particles of the material to be examined, e. g., powder, granules, chips, etc. The particles should have linear dimensions sufficiently small and be so distributed as to permit simultaneous observation of approximately equal areas of the sample and surrounding in the field.

The thickness of the particles should be significantly less than the working distance of the microscope objective.

### 4. PROCEDURE

#### 4.1 Method A

The procedure for the Abbe refractometer is described here. For other refractometers the procedure may be modified, if necessary.

The determination is carried out at  $20 \pm 0.5$  °C.

A small drop of the contacting liquid is placed on the polished surface of the test specimen which is then placed in firm contact with the surface of the prism with the polished edge of the specimen towards the source of light. The index arm of the refractometer is then adjusted until half of the eyepiece field is dark. The compensator (Amici prisms) drum is then adjusted until all colour is removed from the field, after which the index arm is adjusted by means of the vernier until the dividing line between the light and dark portions of the field coincides exactly with the point of intersection of the eyepiece cross-hairs.

The refractive index of the material for the sodium D line is then read on the instrument scale.

Precision: about 0.001.

The dispersion, if required, can be found by noting the compensator drum reading and applying this, together with the value of the refractive index, to a chart supplied with the instrument.