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ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1399

DETERMINATION OF THE PERMEABILITY
OF VULCANIZED RUBBERS TO GASES
(CONSTANT VOLUME METHOD)

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1399, *Determination of the permeability of vulcanized rubbers to gases (Constant volume method)*, was drawn up by Technical Committee ISO/TC 45, *Rubber*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of Draft ISO Recommendation No. 1399, which was circulated to all the ISO Member Bodies for enquiry in July 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	Sweden
Austria	Iran	Switzerland
Canada	Israel	Thailand
Colombia	Italy	Turkey
Czechoslovakia	Netherlands	U.A.R.
France	New Zealand	United Kingdom
Germany	Poland	U.S.S.R.
Hungary	Spain	

No Member Body opposed the approval of the Draft.

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

**DETERMINATION OF THE PERMEABILITY
OF VULCANIZED RUBBERS TO GASES
(CONSTANT VOLUME METHOD)**

INTRODUCTION

The measurement of the permeability of rubber to permanent gases is important in the evaluation of rubbers for such products as inner tubes, tubeless tyre liners, hoses, balloons or other gas containers, or seals. The measurement is also of theoretical importance in the study of characteristics of diffusion and gas solubility in relation to polymer structure. The fundamental requirements of a permeability test for industrial use are accuracy, rapidity and good temperature control, combined with maximum simplicity in the assembly of the equipment.

1. SCOPE

This ISO Recommendation describes a method for the determination of the permeability of vulcanized rubbers to gases.

2. DEFINITION

Permeability of rubber to gases. The rate of flow by diffusion of gas between opposite faces of a unit cube of non-porous rubber, for unit difference in pressure, when tested under controlled pressure and temperature.

3. APPARATUS

(See Fig. 1 and 2)

- 3.1** *Test cell* in which the test piece may be clamped round its periphery in a gas-tight manner so as to expose one surface to gas under pressure. The other surface of the test piece should be supported against the force due to the gas pressure so that no deformation takes place. For this reason the low-pressure side of the test cell should be filled with a rigid, easily permeable, packing piece which may consist of a disc of microporous ebonite or discs of fine wire gauze which completely fill the cavity. A means of indicating gas pressure up to about $5 \times 10^5 \text{ N/m}^2$, with an error of no more than 1 %, should be connected to the high-pressure side of the cell.

The internal volume of the high-pressure side of the test cell should be at least 25 cm^3 to minimise the pressure loss due to diffusion during a test which may last several hours.

The internal volume of the low-pressure (atmospheric) side of the test cell should be kept to a minimum by the use of permeable packing as described above and by small diameter passages through the dismountable coupling and tubing to the manometer. For the design shown in Figure 2, a total volume between test piece and datum mark of 1 to 2 cm^3 is typical.

The test cell should be of metal construction with sufficient mass to assist temperature stability, and should be provided with a drilled pocket to hold a suitable temperature measuring device.