

INTERNATIONAL STANDARD



2303

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Rubber, isoprene (IR) — Non oil-extended, solution-polymerized types — Test recipe and evaluation of vulcanization characteristics

*Caoutchouc polyisoprène (IR) — Types polymérisés en solution et non étendus à l'huile — Formule
d'essai et évaluation des caractéristiques de vulcanisation*

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FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2303 was drawn up by Technical Committee ISO/TC 45, *Rubber and rubber products*, and circulated to the Member Bodies in March 1974.

It has been approved by the Member Bodies of the following countries :

Australia	France	Sweden
Belgium	Germany	Thailand
Brazil	Hungary	Turkey
Bulgaria	Italy	United Kingdom
Canada	New Zealand	U.S.A.
Chile	Poland	U.S.S.R.
Czechoslovakia	Romania	Yugoslavia
Egypt, Arab Rep. of	Spain	

No Member Body expressed disapproval of the document.

Rubber, isoprene (IR) — Non oil-extended, solution-polymerized types — Test recipe and evaluation of vulcanization characteristics

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies standard materials, equipment and processing methods for evaluating vulcanization characteristics of non oil-extended, solution-polymerized isoprene rubbers (IR).

2 REFERENCES

ISO/R 37, *Determination of tensile stress-strain properties of vulcanized rubbers.*

ISO 1795, *Raw rubber in bales — Sampling.*

ISO 1796, *Raw rubber — Sample preparation.*

ISO 2393, *Rubber test mixes — Preparation, mixing and vulcanization — Equipment and procedures.*

ISO 3417, *Raw rubber — Measurement of curing characteristics with the oscillating disk curemeter*¹⁾

3 TEST RECIPE FOR EVALUATION OF VULCANIZATION CHARACTERISTICS

3.1 Standard test formula

The standard test formula is given in the following table.

The materials shall be NBS²⁾ Standard reference materials as indicated in the table, or shall be in accordance with equivalent national standards.

Material	NBS Standard reference material number	Parts by mass
Isoprene rubber (IR)	—	100,00
Stearic acid	372	2,00
Zinc oxide	370	5,00
Sulphur	371	2,25
Oil furnace black (HAF)*	378	35,00
TBBS**	384	0,70
		Total 144,95

* The current Industry Reference Black may be used in place of NBS 378, but this may give slightly different results.

** *N-tert-butyl-2-benzothiazole sulphenamide* (powder form). This material must be stored under dry and cool conditions.

3.2 Procedure

3.2.1 Equipment and procedure

Equipment and procedure for the preparation, mixing and vulcanization shall be in accordance with ISO 2393.

3.2.2 Mill mixing procedure

The standard laboratory mill batch mass, in grams, shall be based on four times the formula mass. The surface

1) At present at the stage of draft.

2) National Bureau of Standards of the U.S.A.

temperature of the rolls shall be maintained at $70 \pm 5^\circ\text{C}$ throughout the mixing.

NOTE — All mill openings shall be adjusted to maintain a good rolling bank at the nip of the rolls during mixing.

Duration
(min)

3.2.2.1 Pass the rubber between the rolls twice without banding, with the mill opening set at 0,5 mm 2

3.2.2.2 Band the rubber with the mill opening set at 1,4 mm and make two 3/4 cuts from each side 2

NOTE — Some types of isoprene rubber go to the back roll, in which case the stearic acid shall be added and after its incorporation the rubber can usually be transferred to the front roll. In addition, certain tougher types of isoprene rubber may require slightly longer breakdown before the addition of other materials in order to obtain a good rolling bank.

3.2.2.3 Set the mill opening to 1,7 mm and add the stearic acid. Make one 3/4 cut from each side 2

3.2.2.4 Add the zinc oxide and the sulphur. Make one 3/4 cut from each side 3

3.2.2.5 Add the carbon black evenly across the mill at a uniform rate. When about half the black has been incorporated, open the mill to 1,9 mm and make one 3/4 cut from each side. Then add the remainder of the carbon black. Be certain to add the black that has dropped into the mill pan. When all the black has been incorporated, make one 3/4 cut from each side 13

3.2.2.6 Add the TBBS with the mill opening still at 1,9 mm. Make three 3/4 cuts from each side . . 2

3.2.2.7 Cut the batch from the mill. Set the mill opening to 0,8 mm and pass the rolled batch endwise through the rolls six times 3

Total time 27

3.2.2.8 Sheet the batch to an approximate thickness of 6 mm and check weigh.

3.2.2.9 Sheet the batch to approximately 2,2 mm for preparing test slabs or to the appropriate thickness for preparing ISO ring specimens.

3.2.2.10 Condition the batch for 2 to 24 h after mixing and prior to vulcanizing.

4 EVALUATION OF VULCANIZATION CHARACTERISTICS ACCORDING TO STRESS-STRAIN PROPERTIES

Vulcanize sheets at 135°C for three periods selected from a cure series of 20, 30, 40 and 60 min.

Condition the vulcanized test slab for 16 to 72 h.

Measure the stress-strain properties in accordance with ISO/R 37.

NOTE — The three periods of cure selected shall cover the undercure, optimum cure and overcure of the polymer under test.

Curemeter testing in accordance with ISO 3417 may be considered as an alternative method for measuring the vulcanization characteristics.