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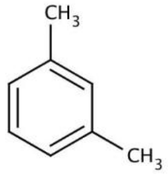
*भारतीय मानक मसौदा*
**मैटा-ज़ाइलीन — विशिष्टि**

# *Draft* Indian Standard
# meta-XYLENE — SPECIFICATION
(ICS 71.080.15)

| Organic Chemicals, Alcohols and Allied Products Sectional Committee, PCD 09 | Last date for receipt of comment: **23 September 2025** |
|---|---|

FOREWORD
(*Formal clauses to be added later*)

Meta-xylene, is an aromatic compound with chemical formula $C_6H_4(CH_3)_2$ and structural formula as:



It is also known as 1,3-dimethylbenzene and is a colourless, flammable, organic solvent with a sweet odour. The major use of meta-xylene is in the production of isophthalic acid, which is used as a copolymerizing monomer to alter the properties of polyethylene terephthalate.

Meta-xylene is highly flammable and can be dangerous if inhaled, ingested, or comes into contact with the eyes or skin. IS 4644: 1968 'Code of safety for benzene, toluene and xylene' may be referred to for details regarding its toxicity, its storage, and handling, etc.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## 1 SCOPE

This standard prescribes the requirements, methods of sampling and tests for meta-xylene (*m*-xylene).

## 2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

| *IS No.* | *Title* |
|---|---|
| IS 1070 : 2023 | Reagent grade water — Specification (*fourth revision*) |
| IS 1260 (Part 1) : 1973 | Pictorial markings for handling and labelling of goods: Part 1 Dangerous goods (*first revision*) |
| IS 1447 (Part 1) : 2021 | Methods of sampling of petroleum and its products: Part 1 Manual sampling (*second revision*) |
| IS 1448 (Part 160) : 2017/ISO 20846 : 2011 | Methods of test for petroleum and its products: Part 160 Determination of sulphur content of automotive fuels — Ultraviolet fluorescence method |
| IS 1448 (Part 180) : 2020/ISO 16591 : 2010 | Methods of test for petroleum and its products: Part 180 Petroleum products — Determination of sulphur content — Oxidative microcoulometry method |
| IS 8768 : 2000 | Method of measurement of colour in liquid chemical products platinum-cobalt scale (*second revision*) |

## 3 REQUIREMENTS

### 3.1 Description

*m*-Xylene is a colorless liquid, free of haze, particulates or suspended matter particles.

**3.2** The material shall also comply with the requirements given in Table 1, when tested as prescribed in col (4) and col (5) of Table 1.

### 3.3 Quality of Reagents

Unless specified otherwise, 'pure chemicals' and distilled water (*see* IS 1070) shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities, which affect the result of analysis.

**Table 1 Requirements for *m*-Xylene**
(*Clauses* 3.2 *and* 5.2)

| **Sl No.** | **Characteristics** | **Requirements** | **Methods of Test, Refer to** | |
|---|---|---|---|---|
| | | | Annex | IS |
| (1) | (2) | (3) | (4) | (5) |
| i) | Appearance | Pass | A | — |
| ii) | Purity (*m*-xylene content), percent by mass, *Min* | 99.5 | B | — |
| iii) | *o*-Xylene, percent by mass, *Max* | 0.30 | B | — |
| iv) | *p*-Xylene, percent by mass, *Max* | 0.20 | B | — |
| v) | Ethylbenzene, percent by mass, *Max* | 0.20 | B | — |
| vi) | Toluene, percent by mass, *Max* | 0.10 | B | — |
| vii) | Non-Aromatics hydrocarbons, percent | 0.20 | B | — |

| | | | | |
|---|---|---|---|---|
| | by mass, *Max* | | | |
| viii) | Colour, Pt-Co, *Max* | 10 | — | IS 8768 |
| ix) | Total Sulphur, mg/kg, *Max* | 1 | C | IS 1448 (Part 180) |

[1] In case of disputes, Annex C shall be the referee method for determination of total sulphur content.

## 4 PACKING AND MARKING

### 4.1 Packing

The material shall be packed in metallic or glass containers, when used for small applications. While for bulk transport, the material is transported through road tankers, rail wagon, etc. or as agreed between buyers and suppliers. All containers should be securely packed and sealed.

### 4.2 Marking

**4.2.1** Each container shall be securely closed and shall bear the following information:

a) Name of the material;
b) Name of the manufacturer and recognized trademark, if any;
c) Month and year of manufacture;
d) Lot or batch number;
e) Net weight and gross weight; and
f) Any other statutory requirement.

**4.2.2** For supplies of material in bulk, a test certificate certified by authorized person of the manufacturer's organization containing the details mentioned at **4.2.1** along with date of analysis shall be provided for each consignment.

**4.2.3** All containers/consignments of *m*-xylene shall bear the label as given in Fig. 5 of IS 1260 (Part 1). The lower half of the label shall have the following words printed in red letters. Any other labels or warnings or other statements required by statutes, regulations or ordinances may also be used in combination or separately.

**Warning**

**HIGHLY FLAMMABLE;**

**VAPOUR HARMFUL;**

**KEEP AWAY FROM HEAT, HOT SURFACES, SPARK, OPEN FLAME AND OTHER IGNITION SOURCES;**

**KEEP CONTAINER TIGHTLY CLOSED;**

**TAKE PRECAUTIONARY MEASURES AGAINST STATIC DISCHARGES;**

**USE ONLY WITH ADEQUATE VENTILATION;**

**AVOID PROLONGED BREATHING OF VAPOUR**

**4.2.4** *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the rules and regulations framed thereunder, and the products may be marked with the Standard Mark.

## 5 SAMPLING

**5.1** The method of drawing representative samples of the material shall be in accordance with IS 1447 (Part 1).

### 5.2 Criteria for Conformity

For declaring the conformity of a lot to the requirements of all the characteristics tested on the composite sample, the test result for each of the characteristics shall satisfy the relevant requirement given in Table 1.

## ANNEX A

[*Table* 1*, Sl No.* (i)]

## DETERMINATION OF APPEARANCE

### A-1 OUTLINE OF THE TEST METHOD

This method is used to check the visual appearance of the high purity *m*-xylene. This test is carried out at room temperature. A known volume of sample is transferred into a clear transparent glass bottle from the sample container. The bottle is held upright against the bright white light and inspected for the presence of the foreign material.

### A-2 PROCEDURE

**A-2.1** Shake vigorously the sample container for atleast 2 min, once the sample attains room temperature. Now immediately transfer 750 ml of sample into a clean and dust free 1 litre transparent clear glass bottle.

**A-2.2** Allow the liquid to settle. Hold the bottle against the bright white light and visually examine for the presence of free water, haziness, cloudiness and particles of size greater than 1 mm. Gently swirl the liquid to create a vertex and observe for any particles that might settled at bottom. The sample should be clear liquid free of sediments.

### A-3 REPORT

**A-3.1** Samples found “Clear liquid free of sediments” (**A-2.2**) shall be reported as “Pass”. Samples not passing the test shall be reported as “Fail” along with the type of contaminant observed.

## ANNEX B

[*Table* 1*, Sl No.* (ii), (iii), (iv), (v), (vi) *and* (vii)]

## DETERMINATION OF *m*-XYLENE CONTENT (PURITY) AND ITS IMPURITIES

### B-1 GENERAL

The method describes the determination of purities and impurities in *m*-xylene by gas chromatographic (GC) by external calibration.

## B-2 OUTLINE OF THE TEST METHOD

**B-2.1** This method is applicable for the determination of purity and trace impurities in *m*-xylene by gas chromatographic (GC) technique. The instrument is calibrated using external standards. Aliphatic hydrocarbons up to $C_{10}$ and individual mono cyclic aromatic hydrocarbons up to $C_{10}$ can be measured accurately as low as 100 ppm (mass). Purity percent is calculated by subtracting total impurities from 100.

**B-2.2** A known volume of sample is injected, manually or using auto sampler in the gas chromatographic instrument. The peak area of each component is measured, and concentration of each component is calculated using linear calibration curve.

NOTE — Small amount of benzene may not be fully separated from non-aromatic peaks. Ethylbenzene and *p*-xylene elutes very close to *m*-xylene peak.

## B-3 APPARATUS

### B-3.1 Gas Chromatograph

Any gas chromatograph equipped with a flame ionization detector (FID), a split/splitless injector and a suitable electronic integrator/software may be used with following accessories and operating condition.

**B-3.1.1** *Column*, fused silica column with a stationary phase of cross-linked polyethylene glycol (PEG); length 60 m; internal diameter 0.32 mm and 0.25 µm film thickness or equivalent.

**B-3.1.2** *Gas Chromatographic Condition Parameters*

a) **Injector**

i) Temperature : 230 °C
ii) Injection volume : 0.4 µl to 0.6 µl
iii) Split ratio : 1:150

b) **Oven Temperature**

i) Start : 70 °C for 29 min
ii) Ramping : 10 °C/min up to 210 °C
iii) End : 210 °C for 20 min

c) **Detector**

i) Temperature : 240 °C

d) **Carrier Gas**

i) Carrier gas : Hydrogen & Air
ii) Carrier gas flow : 45 ml/min for $H_2$ and 450 ml/min for Air

NOTES
1. Auto sampler for sample injection may also be used.
2. The above gas chromatographic (GC) conditions are suggestive. However, any GC method having

difference in detector, column packing material and type (like packed/capillary, diameter, length, film thickness etc.), calibration technique (internal/external standard, area normalization, percent area etc.), carrier gas (He, $H_2$, $N_2$) may be used with applicable GC operating parameters, provided standardization and calibration of the components is established after setting GC parameters for the resolution and accuracy level as specified in this standard.

## B-4 REAGENTS

**B-4.1 *m*-Xylene**, certified reference material

**B-4.2 n-Nonane**, certified reference material

**B-4.3 Benzene**, certified reference material

**B-4.4 Toluene**, certified reference material

**B-4.5 Ethylbenzene**, certified reference material

**B-4.6 *o*-Xylene**, certified reference material

**B-4.7 *p*-Xylene**, certified reference material

**B-4.8 Cumene**, certified reference material

**B-4.9 1,2,4-Trimethylbenzene**, certified reference material

NOTE — In case certified reference material of regents as mentioned at **B-4.1** to **B-4.9** are unavailable, high purity chemicals (known purity) may also be used as an alternative to certified reference material.

## B-5 CALIBRATION AND STANDARDIZATION

To calibrate the instrument, use of certified reference material is recommended. Alternately, calibration blend may be prepared by the following procedure.

### B-5.1 Preparation of Calibration Blend

All chemicals including *n*-nonane, benzene, toluene, ethylbenzene, *o*-xylene, *m*-xylene (high purity), *p*-xylene, cumene, 1,2,4-trimethyl benzene are cooled to room temperature and the blend is prepared by mixing the chemicals, as prescribed in Table 2:

**Table 2 Typical Concentration**
(*Clause* B-5.1)

| | Volume | Concentration, volume percent | Density at 20 °C | Concentration, mass percent |
|---|---|---|---|---|
| *n*-Nonane | 20 µl | 0.020 | 0.718 | 0.017 |
| Benzene | 10 µl | 0.010 | 0.879 | 0.010 |
| Toluene | 20 µl | 0.020 | 0.867 | 0.020 |
| Ethyl Benzene | 100 µl | 0.100 | 0.867 | 0.101 |
| *p*-Xylene | 100 µl | 0.100 | 0.861 | 0.100 |
| *m*-Xylene | 99.70 ml | 99.70 | 0.864 | 99.70 |
| Cumene | 10 µl | 0.010 | 0.862 | 0.010 |
| *o*-Xylene | 20 µl | 0.020 | 0.880 | 0.020 |

| | | | | |
|---|---|---|---|---|
| 1,2,4-Trimethyl Benzene | 20 µl | 0.020 | 0.866 | 0.020 |

NOTE — Alternate concentration blend may also be used, that are more closely approximate to the typical sample mentioned above.

**B-5.2** The instrument is set as per **B-3.1.2** or as per manufacturer's recommendation. Inject the calibration blend once it attains room temperature. Calculate the response factor for each component as:

$$\text{Response factor of component Y } (RF) = \frac{Concentration\ of\ component,\ Y}{Area\ of\ component,\ Y}$$

NOTE — RF of *n*-nonane is used for non-aromatic fraction. While RF of cumene is used for all aromatics hydrocarbon with $C_9$ or greater except *o*-xylene, ethylbenzene and *m*-xylene, whose RF are calculated and used independently.

Take average of minimum three analyses and calculate average response factor.

## B-6 PROCEDURE

**B-6.1** Ensure that GC is set as recommended before injecting the sample. Inject the sample in GC once it attains room temperature.

**B-6.2** All the peaks before *o*-xylene excluding benzene, toluene, ethyl benzene, *p*-xylene, *m*-xylene and cumene are considered non-aromatics. All peaks eluted after *o*-xylene plus cumene are considered as $C_9$ plus aromatics.

**B-6.3** $C_9$ plus aromatics are grouped together and reported. If required, cumene is reported separately, and remaining components are reported as $C_9$ plus aromatics.

## B-7 CALCULATION

**B-7.1** Calculations are performed by the instrument to display results in desired format. For manual calculation, the mass percent concentration of each impurity is calculated by the formula as given:

$$\text{Concentration of component Y, percent} = \frac{100 \times F \times G}{N}$$

where

$F$ = response factor of Y;
$G$ = area of component Y; and
$N$ = total peak area of all the components

**B-7.2** Purity, percent = 100 – sum of percent of all impurities

## B-8 REPORT

Report all the purity of *m*-xylene, individual impurities, non-aromatics hydrocarbons and total $C_9$ plus aromatics nearest to 0.01 mass percent.

## B-9 PRECISION AND BIAS

### B-9.1 Repeatability

The difference between two results obtained in the same laboratory, same operator, and same instrument on same sample shall not differ more than the values shown in Table 3.

## B-9.2 Reproducibility

The difference between two results obtained in the different laboratories, different operator and different instrument of the sample shall not differ more than the values shown in Table 3. Atleast one or all the conditions mentioned above are considered for reproducibility calculations.

**Table 3 Repeatability and Reproducibility**
(*Clauses* B-9.1 *and* B-9.2)

| Sl No. (1) | Components (2) | Average Concentration, Mass Percent (3) | Repeatability (4) | Reproducibility (5) |
|---|---|---|---|---|
| i) | Non-aromatics | 0.112 0 | 0.018 8 | 0.027 4 |
| ii) | Benzene | 0.000 2 | 0.000 2 | 0.000 3 |
| iii) | Toluene | 0.015 6 | 0.005 4 | 0.007 1 |
| iv) | Ethyl Benzene | 0.040 8 | 0.002 6 | 0.008 7 |
| v) | *p*-Xylene | 0.077 | 0.031 5 | 0.042 4 |
| vi) | *m*-Xylene | 99.723 2 | 0.016 5 | 0.025 1 |
| vii) | *o*-Xylene | 0.023 3 | 0.001 0 | 0.029 8 |
| viii) | $C_9$ plus Aromatics | 0.007 8 | 0.001 4 | 0.016 8 |

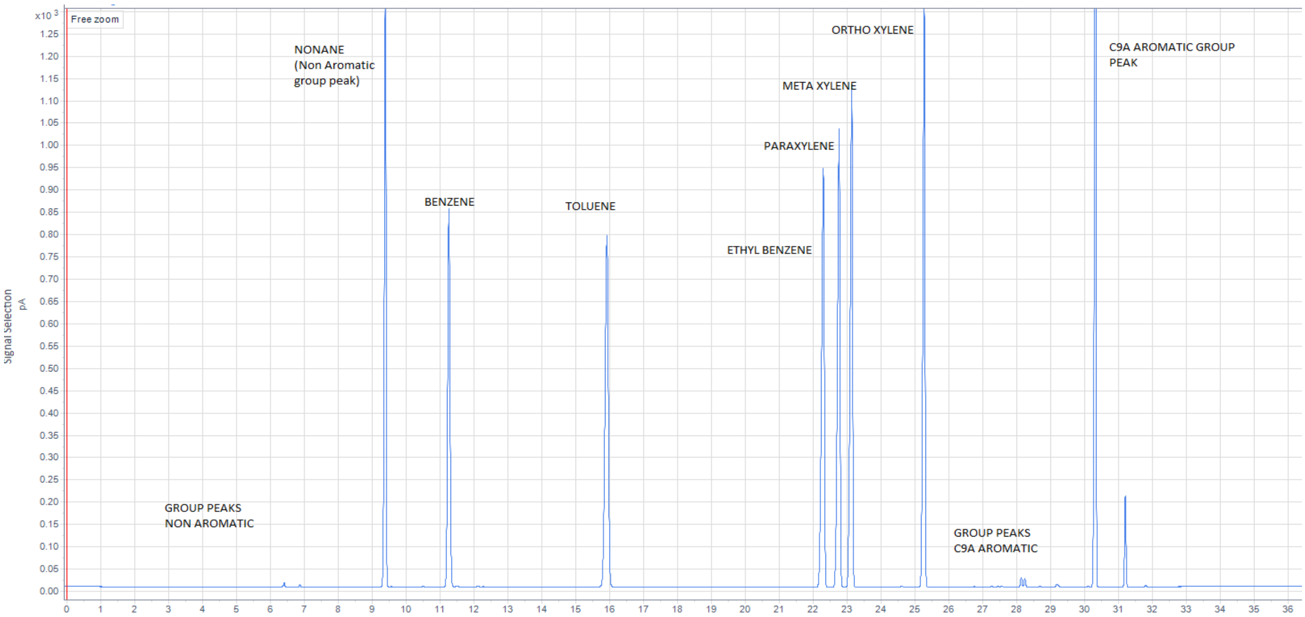


FIG. 1 TYPICAL CHROMATOGRAM OF *m*-XYLENE

## ANNEX C

[*Table* 1*, Sl No.* (ix)]

## DETERMINATION OF TOTAL SULPHUR

### C-1 GENERAL

Two methods, namely, Method A determination of sulphur content by oxidative combustion and UV fluorescence detection technique and IS 1448 (Part 180) determination of sulphur content by oxidative micro coulometry method have been prescribed. In case of disputes, Annex C shall be the referee method for determination of total sulphur content.

### C-2 METHOD A

### C-2.1 Outline of the Test Method

**C-2.1.1** This method is used for the determination of total sulphur in high purity *m*-xylene by oxidative combustion and UV fluorescence detection technique. This method is applicable for total sulphur in the range of 0.1 ppm to 10 ppm (*wt*/*wt*).

**C-2.1.2** A known volume of sample is injected, manually or using auto sampler, into the combustion tube which is maintained at high temperature. Sample vapour is combusted by oxygen which produces carbon dioxide ($CO_2$), sulphur dioxide ($SO_2$) and water vapour. The sample vapour is swept into the combustion zone by inert gas like argon. Inside the combustion tube, combustion gases then passed through a drier to remove water vapour, which then enters detector, where it is exposed to UV light. Sulphur dioxide gas absorbs the specific frequency of UV light and enters into the excited state. Upon returning from excited state to normal state, energy is released (known as fluorescence) in form of UV light. Intensity of UV light emitted is determined by a photo multiplier tube and converted into an electrical signal, which is a measure of amount of sulphur present in the sample.

NOTES

1. Halide's concentration in excess of 10 percent and nitrogen content in excess of 1 500 ppm may cause interference in determination of total sulphur.
2. 1 mg/kg is equal to 1 ppm.

### C-2.2 Apparatus

**C-2.2.1** *Total Sulphur Analyzer*, equipped with combustion furnace; combustion tube, capable to withstand temperature of about 900 °C to 1 200 °C; automatic sample charger; flow controllers; gas driers; UV reaction cell; detector and a software to control the operating parameters.

**C-2.2.2** *Syringe*

### C-2.3 Reagents

**C-2.3.1** *Dibenzothiophene* (purity 98 percent, minimum) or *Dibutyl Sulfide* (purity 98 percent, minimum)

**C-2.3.2** *Inert Gas or Air*, purity 99.99 percent, minimum.

**C-2.3.3** *Oxygen Gas*, purity 99.99 percent, minimum.

**C-2.3.4** *Solvent*

Any suitable solvents capable of dissolving sulphur compound, like iso-octane, *m*-xylene etc. can be used.

**C-2.3.5** *Oxidation Reagent*, if required.

### C-2.4 Calibration and Standardization

**C-2.4.1** For calibration, standards may be prepared using pure chemicals like dibenzothiophene or dibutyl sulfide or ready-made certified reference material may also be used.

**C-2.4.2** *Stock Solution Preparation*, approximately 1 000 mg/kg

**C-2.4.2.1** Prepare a stock solution by accurately weighing $W_1$ g of standard chemical (that is dibenzothiophene or dibutyl sulfide) to the nearest 0.1 mg into 100 ml volumetric flask. Dilute it with relevant solvent like iso-octane, *m*-xylene etc. Concentration of the total sulphur is calculated by the formula as given:

$$\text{Total Sulphur (mg/kg)} = \frac{W_1 \times P \times S \times 10^2}{W_2}$$

where

$W_1$ = weight of standard chemical, in g;
$P$ = purity of standard chemical, percent;
$S$ = percentage of sulphur in the standard chemical; and
$W_2$ = total weight (standard + solvent), in g.

**C-2.4.3** Prepare standards of varying concentration by diluting the stock solution (**C-2.4.2**) with the same solvent used while preparing stock solution.

**C-2.4.4** *Calibration Curve*

Prepare two separate calibration curves for range of 0.1 mg/kg to 1 mg/kg and 1 mg/kg to 10 mg/kg. To perform the calibration, follow manufacturer’s recommendation. Solvent used for preparation of standards shall be run along with standards and its value shall be considered as blank while plotting the calibration curve. The calibration curve (µgS vs area) should be linear with minimum 0.99 correlation coefficient.

### C-2.5 PROCEDURE

**C-2.5.1** The instrument and operating parameters are set as per as per manufacturer’s recommendation. Inject the sample size as recommended by the instrument manufacturer, once the sample attains room temperature. Determine the total sulphur value as calculated by the software.

**C-2.5.2** Take average of atleast three determination to calculate the total sulphur value. Density of the considered for reproducibility calculations sample value can be used for the unit conversion from mass to volume and vice versa.

### C-2.6 Report

Report all sulphur results nearest to 0.1 mg/kg.

### C-2.7 Precision and Bias

**C-2.7.1** *Repeatability*

The difference between two results obtained in the same laboratory, same operator, and same instrument on same sample shall not differ more than the values shown in Table 4.

**C-2.7.2** *Reproducibility*

The difference between two results obtained in the different laboratories, different operators, and different instrument on different sample shall not differ more than the values shown in Table 4. Atleast one or all the conditions mentioned above are considered for reproducibility calculations.

**Table 4 Repeatability and Reproducibility**
(*Clauses* C-2.7.1 *and* C-2.7.2)

| **Sl No.** (1) | **Amount of Sulphur** (2) | **Repeatability** (3) | **Reproducibility** (4) |
|---|---|---|---|
| i) | 0.5 mg/kg | 0.04 | 0.22 |
| ii) | 1.4 mg/kg | 0.11 | 0.59 |
| iii) | 5.3 mg/kg | 0.20 | 0.64 |