Nitration - m-Dinitrobenzene

Experiment 7 - Practical Notes

Name: _____ Roll no.: _____ Date: _____

Aim

To study the specified organic preparation, isolate the assigned product and calculate its yield.

Principle

The existing nitro group deactivates the aromatic ring and directs further electrophilic substitution mainly to the meta position.

Requirements

- Instructor-approved reaction scheme, reagent quantities and laboratory procedure for the selected route.
- Reaction glassware, suitable ventilation, separation apparatus, balance and melting-point apparatus.

Procedure

1. Plan the selected route

Write the balanced reaction and identify the functional-group change, limiting reagent, expected product and hazards. Use the assigned supervised method for the selected option.

2. Carry out the assigned reaction

Measure the prescribed reagents and follow the authorised addition sequence and temperature controls. Record actual reaction observations and the method used.

3. Isolate the product

Use only the supervised assigned work-up for nitrating reagents, then isolate and purify the final product using the approved method.

4. Purify and dry

Apply the assigned recrystallisation or purification method. Record solvent, observations, dry mass and melting range where appropriate.

5. Assess the product

Calculate theoretical and percentage yield. Compare the measured physical properties and assigned identity test; explain that yield alone does not prove purity.

Preparations and Reaction Scheme

Route / product	Starting material and change
m-Dinitrobenzene	Further nitration of the assigned nitroaromatic starting material.

Observations and Record

Record	Student entry
Selected route / balanced equation	_____
Limiting reagent and molar mass	_____
Theoretical product mass	_____
Dry product mass / melting range	_____
Percentage yield / identity finding	_____

Worked Example

The numbers below are illustrative; enter your own observations in the record.

- Theoretical product mass = moles of limiting reagent × stoichiometric product ratio × product molar mass.
- Percentage yield = dry product mass / theoretical product mass × 100.
- Illustration: 0.020 mol of a limiting reagent gives 0.020 mol of a 150 g/mol product. The theoretical mass is 3.00 g; 2.40 g isolated product gives 80.0% yield.

Result

Product: ____. Route: ____. Dry mass: ____. Yield: ____. Physical property / identity evidence: ____.

Precautions

- Use the specific supervised procedure and facilities for corrosive, toxic, oxidising or flammable reagents.
- Record the selected preparation option rather than combining different reaction routes.
- Use dry product mass for yield and the stated test conditions for comparison.

Viva Questions and Answers

1. What directing effect does a nitro group have?

It is deactivating and meta directing in electrophilic aromatic substitution.

2. Why is temperature control needed?

Nitration is exothermic and the authorised procedure controls reaction rate and safety.

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