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Aryl-Amine and Developer Content of Hair Dyes

Practical 19 - Analytical practical

Aim

To quantify specified aryl-amine and developer components of a hair-dye system.

Principle

Aryl-amine precursor content and peroxide-developer content are separate analytical attributes. Use a selective validated chromatographic assay for the named precursor and an appropriate validated redox assay for the developer. A nonspecific total-amine reaction cannot establish each precursor concentration.

Materials and Requirements

- Selected primary-amine reference and test material
- Adopted colour reagent and controlled reaction arrangement
- Spectrophotometer with specified measurement conditions
- Qualified balance and volumetric equipment
- Controlled method and raw-data worksheet

Procedure

1. Identify the exact precursor, developer, separate container components and reporting bases.
2. Prepare a selective precursor extraction and chromatographic calibration with blank, reference and recovery controls.
3. Assess precursor identity, separation and calibrated content under the adopted method.
4. For a peroxide developer use the approved iodometric or other validated method with its reagent blank and standardised titrant.
5. Calculate each component separately, including extraction, dilution and stoichiometric factors; assess independent preparations.
6. Report method suitability, matrix interference and content with the actual specification.

Observations and Record

Enter actual measurements or the supplied teaching data. Record the method, material identity, conditions and units.

Component	Method / reference	Raw response	Content / basis
Named aryl amine	Selective chromatography	Record	Calculate
Peroxide developer	Validated redox assay	Record	Calculate
Blank / recovery	Appropriate controls	Record	Assess

Calculations

- For iodometric peroxide with thiosulfate: mol H_2O_2 = mol thiosulfate / 2, after the prescribed blank correction.
- Content (%) = measured component mass / original component test mass x 100

Worked Example

Illustrative net 5.00 mL of 0.1000 mol/L thiosulfate corresponds to 0.250 mmol H_2O_2, or about 8.50 mg. For a 0.200 g developer portion this is 4.25% w/w H_2O_2.

This is a calculation example, not a recommended consumer product concentration; the precursor result requires its separate calibration.

Result and Interpretation

• Report named precursor and developer results separately with controls and the selected product limits.

Precautions

• Keep derivatisation time and temperature consistent.
• Check reagent background and interfering coloured materials.
• Avoid assuming identical response for different amine structures.
• Use the adopted laboratory procedure, suitable controls and the designated waste arrangements.

Viva Questions and Answers

Why analyse the components separately?

They have different chemistry and can require different reporting bases.

Why use a selective precursor method?

Other amines and matrix constituents can interfere with nonspecific group assays.

Why divide thiosulfate moles by two?

The iodometric reaction chain consumes two thiosulfate moles per peroxide mole under the stated stoichiometry.

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