The oxidation of cyclohexanol by nitric acid

Topic

Alcohols, carboxylic acids, oxidations.

Timing

20 min.

Description

In this experiment students convert cyclohexanol to 1,6-hexanedioic acid (adipic acid) using a ring opening oxidation with nitric acid. Since 1,6-hexanedioic acid is a solid a melting point measurement can be done on the product (mp 152 °C).

Apparatus (per group)

- One 100 cm^3 beaker
- Hot plate
- Three plastic pipettes
- One 50 cm^3 beaker
- One test-tube.

Chemicals (per group)

- Cyclohexanol
- Nitric acid (*ca* 5 mol dm^{-3}, concentrated nitric acid: deionised water 1:1).

Observations

A white crystalline solid should slowly form when the test-tube is cooled in the ice bath. The solid might be slightly brown in colour due to impurities when first filtered off, but this discoloration is removed by washing with water.

Reference

S. Breuer, *Microscale practical organic chemistry*, expt 26. Lancaster: Lancaster University, 1991.

Health & Safety

Students must wear suitable eye protection (splash proof goggles to BS EN166 3). The reaction should be done in a fume cupboard.

Cyclohexanol is a skin and respiratory irritant and is harmful if swallowed or inhaled.

Nitric acid, 5 mol dm^{-3} HNO_3 (aq), is CORROSIVE. .

Credits

Health & safety checked May 2018

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