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AIM: TO PERFORM THE SYNTHESIS OF OIL OF WINTERGREEN. CALCULATE PERCENTAGE YIELD OF SYNTHESIZED PRODUCT

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Requirements

Chemicals

1. Salicylic acid
2. Dry methanol
3. Sulfuric acid
4. Carbon tetra chloride
5. Magnesium sulphate

Apparatus

1. Round bottom flask
2. Reflux condenser
3. Thermometer
4. Separating funnel
5. Beaker
6. Buchner funnel
7. Measuring cylinder

Theory

Methyl salicylate (oil of wintergreen) contains ester function group. Ester can be prepared by corresponding acid and alcohols using esterification process. Esterification is a type of condensation process where water type small molecules eliminate to afford final products.

Physical Properties

Salicylic Acid

- It is a white crystalline solid having boiling and melting point 211°C and 315°C respectively
- It contains acrid taste and exhibit limited solubility in aqueous medium
- Salicylic acid has the pocket for three hydrogen bond acceptors and two hydrogen bond donors

Methanol

- Methanol is a liquid substance and completely soluble in aqueous medium
- Methanol is first compound of alcohol series which has explosive property

Methyl Salicylate

- It has limited solubility in water and highly soluble in organic medium
- It is yellowish liquid having 220°C boiling point

Chemical Properties

Methanol

- Methanol is an alcoholic substance having molecular formula CH_3OH
- Methanol can be obtained from distillation of wood
- Methanol can also be synthesized from hydrogen gas and carbon monoxide gas

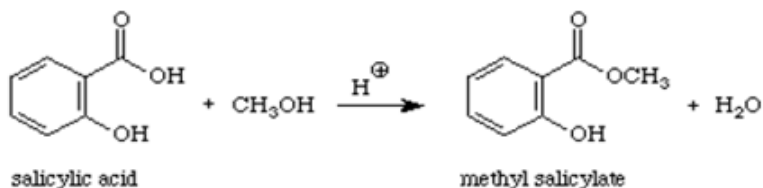
Methyl Salicylate

- Methyl salicylate produces salicylic acid and methanol upon hydrolysis in basic medium.
- Methyl salicylate contains methylated carboxylic group with free phenolic group

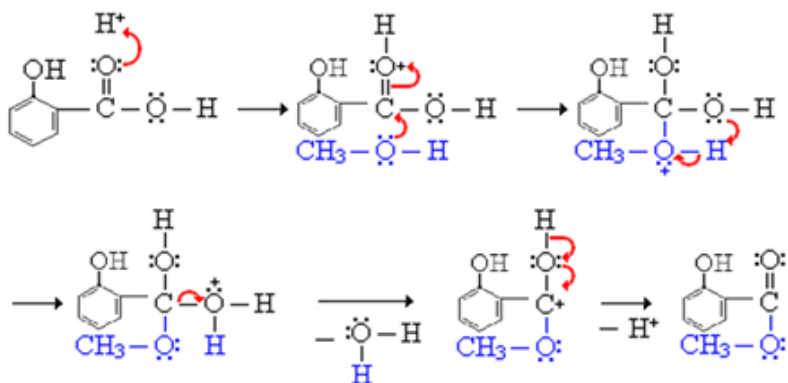
Procedure

1. Add 28g (0.2mol) of salicylic acid, 64g (81ml, 2mol) dry methanol and 8ml of conc. Sulfuric acid in a RBF of 500ml capacity.
2. Attach a reflux condenser assembly with the reaction mixture and boil it for 5hrs.
3. After completion of reaction, pour the residue in cold water and rinse the RBF 2-3 times.
4. Add 10-15ml of carbon tetrachloride and shake vigorously. After some time, methyl salicylate separates at the bottom of the separatory funnel making a distinct layer.
5. Collect the oil of wintergreen/ methyl salicylate in a separate beaker and discard the water layer. Wash the product with sodium bicarbonate to remove any free acids.
6. Wash again with water and dry the product using magnesium sulphate powder.
7. Filter the product using filter paper and collect in RBF fitted with thermometer and an air condenser.
8. Boil the filtrate to remove carbon tetrachloride to afford pure methyl salicylate.
9. Weigh the product and calculate percentage yield.

Reaction



Mechanism



Applications

- Used as a flavouring agent in pharmaceuticals and chewing gums, toothpaste.
- Has analgesic and anti-inflammatory potential which is useful in relieving joint pains.
- Used in the form of a fragrance in liniments, beverages, and food.
- Used as a cooling agents in various formulations.
- Can also be used as an insecticide in various preparations as well as in mouthwash solutions.

Percentage Yield

- 138g salicylic acid forms 152g methyl salicylate
- Therefore, 128g salicylic acid will form.....? (X) g methyl salicylate
- $X = (152 \times 128) / 138 = 30.84\text{g}$
- Theoretical yield = 30.84g
- Practical yield =g
- Percentage yield = (Practical yield/Theoretical yield) $\times 100$

Result: Oil of wintergreen was successfully synthesized from salicylic acid and methanol.