Chapter:
18

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AIM: TO SYNTHESIZE CHALCONE FROM BENZALDEHYDE. RECORD MELTING POINT AND YIELD OF PRODUCT

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Requirements

Chemicals

1. Sodium hydroxide
2. Acetophenone
3. Benzaldehyde

Apparatus

1. RBF
2. Funnel
3. Conical flask
4. Beaker
5. Glass rod

Principle

Claisen-Schmidt condensation defined when benzaldehyde derivatives condensed with alkyl/aryl ketone in basic medium to afford α, β-unsaturated ketone. It follows cross aldol condensation type mechanism where intermediate is aldol which dehydrate in presence of acid/alkali to afford final unsaturated ketone which is known as "**chalcone**". Generally, polar solvents favour the reaction kinetics to afford product in excellent yield.

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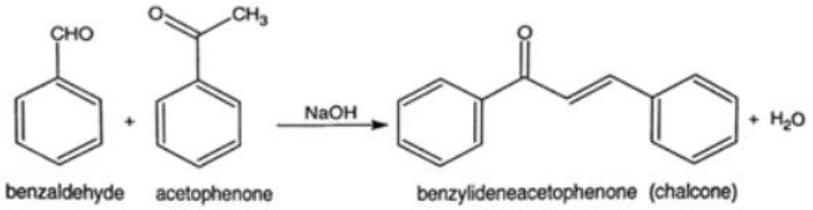
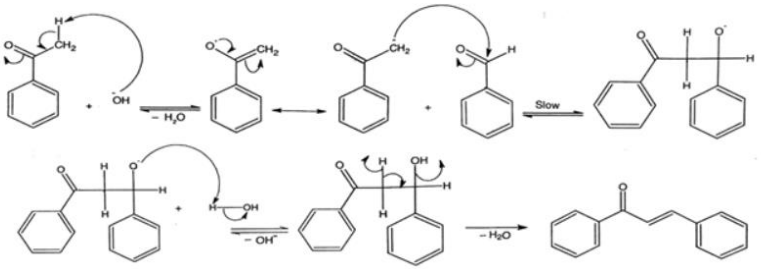
Reaction



Mechanism



Initially, base abstracts the alpha proton of acetophenone to produce enolate ion which is stabilized by resonance. These enolate/carbanion attacks further on electrophilic centre of another carbonyl molecule to form adduct with the creation of new carbon-carbon bond. After neutralizing this adduct, aldol will form. Finally, chalcone or 1, 3-diphenylpropenone can be obtained as a yellow solid after dehydration of aldol intermediate.

Physical Properties

Benzaldehyde

- Benzaldehyde has significant solubility in ethanol and diethyl ether and limited aqueous solubility.
- Benzaldehyde is sharp smelled liquid.

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Acetophenone

- Acetophenone has limited water solubility and excellent solubility in organic medium.
- Acetophenone has pleasant odour liquid.

Chalcone

- Chalcone is insoluble in water and soluble in organic medium.
- Chalcone is a light yellowish solid substance.

Chemical Properties

Benzaldehyde

- It has –CHO functional group and aromatic.
- It has reducing property.
- It behaves as an electrophile and can react with nucleophilic substances.

Acetophenone

- It is an aromatic ketone and contains nucleophilic centre.
- It is an important substance for aldol and other condensation reaction.
- It can be synthesized by Friedel-craft reaction from benzene.

Chalcone

- Chalcone contains chromophoric and auxochromic groups and is UV-active.
- Chalcones are pharmacologically potential secondary metabolites in plants.

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Procedure

1. Mix 5 mmol of acetophenone, 5 mmol of benzaldehyde, 15 ml of ethanol in a RBF.
2. Further, add 40% potassium hydroxide solution slowly with continuous stirring.
3. Stirr the reaction mixture for 8-10 hours using magnetic stirrer and check the progress of reaction using thin layer chromatography.
4. After completion of reaction, filter the crude product using filter paper/Suction and wash with cold water 2-3 times.
5. Purify the product using recrystallization with cold ethanol.
6. Separate the pure yellow crystals of chalcone and dry the product.
7. Weigh the product and record melting point using capillary and melting point appratus to confirm purity.
8. Calculate the percentage yield of pure chalcone.

Melting Point and Percentage Yeild

Melting Point of Chalcone: 55-57° C

Percentage Yield = (Practical Yield/Theoretical Yield) × 100 %

Applications

1. Chalcones are proved to have diverse biological potential and active against bacteria, viruses, inflammation, diabetes, CNS disorders, leishmania etc.
2. Chalcones and derivatives also possess the antioxidant activity and are effective to kill tumor cells.

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3. Chalcones are reported to have potential against human immunodeficiency virus.

Result: Chalcone was successfully synthesized and recorded its percentage yield=……..%.