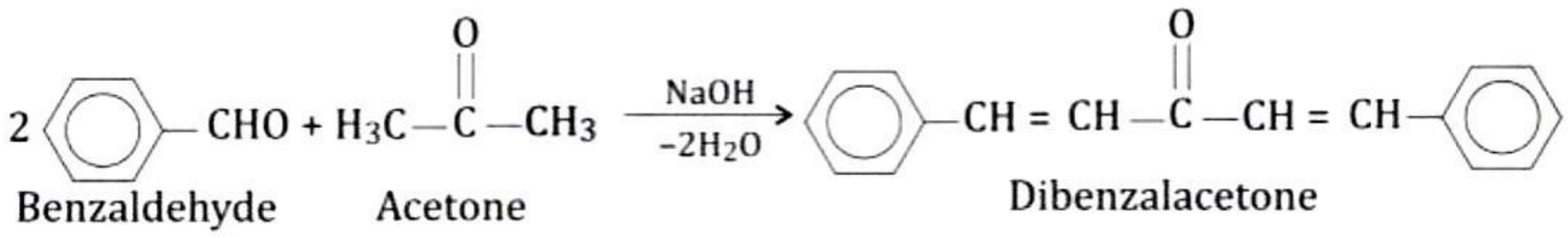
EXPERIMENT

Aim

To prepare a sample of dibenzalacetone.

Theory

The preparation of dibenzal acetone is an example of Claisen-Schmidt reaction. This reaction takes place between aromatic aldehydes and aliphatic ketones in presence of sodium hydroxide. Two moles of benzaldehyde condense with one mole of acetone to give dibenzalacetone. The chemical equation can be written as:



Material Required

Conical flask (100 ml), beaker (250 ml), test-tube, funnel, filter-papers, etc.
Benzaldehyde = 2.5 ml
Acetone = 1.0 ml
10% NaOH solution = 5 ml
Rectified spirit = 25 ml

Procedure

1. Take a conical flask (100 ml) and add 2.5 ml benzaldehyde, 1.0 ml of acetone and 25 ml of methylated spirit. Cork the flask and shake to obtain a clear solution.
2. Take 5 ml of 10% NaOH solution in a test-tube and add this to conical flask drop by drop with shaking of the flask. Maintain the temperature of the reaction mixture between 20-25°C during addition of sodium hydroxide solution.
3. Cork the flask again and shake vigorously for about 10 minutes, releasing pressure from time to time.
4. Allow it to stand for about 20 minutes at room temperature and then cool in ice water for a few minutes.
5. Filter the yellow coloured solid and wash it with water to remove traces of alkali.
6. Recrystallization of dibenzalacetone.
7. Dissolve the above yellow coloured crude solid in a minimum amount of hot rectified spirit and then allow it to cool slowly. Pale yellow crystals of dibenzalacetone separate out. Filter the crystals and dry.
8. Weigh and record its yield and melting point.

Result

Weight of dibenzalacetone obtained = ...g

Melting point of dibenzalacetone is .....°C

Note: (Approximate expected yield of dibenzalacetone is 1.5 g) The melting point of dibenzalacetone is 112°C.

Precautions

1. Add NaOH dropwise to the reaction mixture with constant shaking and maintaining the temperature around 20°C.
2. Wash the ppt. with water to remove traces of sodium hydroxide sticking to them.
3. Use a minimum amount of rectified spirit to dissolve crude sample for crystallization.

VIVA VOCE

Q 1. Explain the reaction mechanism involved in the synthesis of dibenzalacetone.

Ans. The synthesis involves an aldol condensation reaction between two molecules of benzaldehyde. The base-catalyzed reaction forms an enolate ion intermediate, which reacts with another benzaldehyde molecule, leading to the formation of dibenzalacetone.

Q 2. Why is benzaldehyde used as one of the reactants in the synthesis?

Ans. Benzaldehyde is used because it contains a carbonyl group necessary for the aldol condensation. Its electrophilic nature allows it to react with the enolate ion formed during the reaction.

Q 3. How does the choice of base influence the reaction outcome?

Ans. The base initiates the formation of the enolate ion. A strong, non-nucleophilic base, like sodium hydroxide, is preferred to avoid unwanted side reactions and ensure the desired aldol condensation occurs.

Q 4. Discuss the importance of using a non-nucleophilic base in this synthesis.

Ans. A non-nucleophilic base prevents nucleophilic attack on the carbonyl group, which could lead to undesired side reactions. Sodium hydroxide serves as a strong non-nucleophilic base.

Q 5. What is the purpose of the ice bath during the reaction?

Ans. The ice bath controls the reaction temperature, preventing overheating and side reactions. It ensures a controlled and efficient aldol condensation.

Q 6. How can you confirm the formation of dibenzalacetone during the reaction?

Ans. The presence of dibenzalacetone can be confirmed through spectroscopic techniques like NMR or IR. Additionally, the compound can be isolated and characterized by its physical properties.

Q 7. Explain the applications or significance of dibenzalacetone in organic chemistry.

Ans. Dibenzalacetone is often used as a precursor in the synthesis of various organic compounds. Its conjugated system makes it useful in studies related to conjugated dienes and enones. Additionally, it has applications in the field of photochemistry.