Research On General Purpose Of Catalysis In Organic Synthesis For Green Chemistry

[1]Saraswati.M.Pawar, [2]Rasika.P.Devale

Department of B Pharmacy, Yashoda Technical Campus,
Satara 415001

Abstract: The "foundation pillar" of green chemistry has been identified as catalysis. Better yields/increased selectivity/milder conditions, which describe catalytic processes by definition, are of course also qualifying for green chemistry, leading one to believe that green chemistry is a subset of catalytic chemistry. Processes categorised as "green" have used homogeneous, heterogeneous, and supported (nano)catalysts . Environmental parameters are typically given special attention in papers wearing this label, both in terms of catalyst operation (high turn-over number, reasonable stability, and low cost) and reaction conditions (high turn-over number, moderate stability, and low cost) (safety aspects).The review's goals are to prepare "organic compounds using locally available materials in order to acquire access to goods that are cost-effective, quick, and high-quality.

Key words - Conventional, atom economy, green chemistry, Catalysis,

Introduction

Green chemistry is defined as "the application of a set of principles in the design, manufacture, and application of chemical products that lowers or eliminates the use or synthesis of hazardous compounds." Currently, several ways are being developed in laboratories, particularly at the undergraduate level, to help students become more successful.[1]

Learn what it means to use green and safe chemistry. Various hazardous by-products could also be reduced. Alternate methods for synthesising typical synthetic products When a higher temperature is required, a catalyst could speed up the reaction. From an environmental and economic standpoint, the energy aspect in the processes should be considered highly.[2]

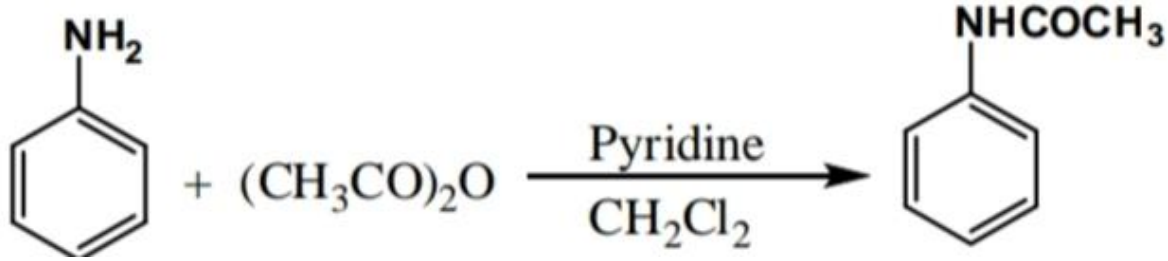
Application of green Catalyst in organic synthesis

Below are some examples of popular preparations, along with suggestions for making them safer and more environmentally friendly.[3]

1.Primary amine acetylation (Preparation of acetanilide)

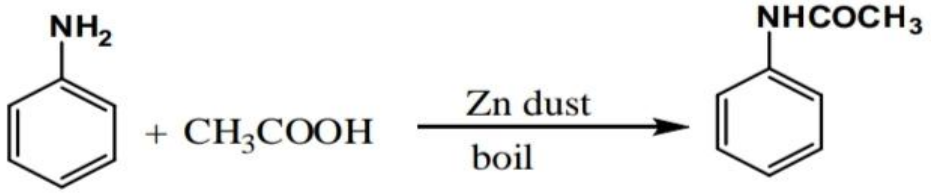
Principal -Mono acetyl derivatives are formed when primary amines react with acid chlorides or anhydrides. Acetanilide is an organic chemical compound (meaning it's largely made up of carbon and hydrogen) that belongs to the amide functional group. This indicates that the carbonyl group (carbon-oxygen double bond) is connected to a nitrogen atom directly.[4] It also has an aromatic ring, which is a six-carbon ring with an alternating double-single-double-single bonding pattern all the way around it. Acetanilide is an analgesic that is chemically similar to acetaminophen and was previously known as Antifebrin (or Tylenol). Acetanilide, on the other hand, is poisonous, unlike acetaminophen. An acetylation process is used to make acetanilide from aniline. Acetylation is a technique for adding an acetyl protecting group to a primary amine.[5]

Convention method-Pyridine is poisonous and environmentally unfriendly, hence the solvent dichloromethane is employed.The law of atom-economy is broken when acetic anhydride leaves one molecule of acetic acid unused. [6]



Non-green component -the use of chlorinated solvent like CH2CL2, pyridine is also not eco-friendly and acetic anhydride leaves one molecule of acetic acid unused with devoid the rule of atom economy.[7]

Green approach - Using a water condenser, a mixture of aniline and zinc dust in acetic acid was cooked over a mild flame in a round bottom flask. The heating was kept on for roughly 2 hours. After cooling and vigorous stirring, the reaction mixture was carefully put into cold water in a beaker. [8] Acetanilide's gleaming crystals, were gradually split The acetanilide crystals were



recovered by filtration after 15 minutes. The crystals were solid. The substance was dried after being rinsed over the Buchner funnel with water. In boiling water, it solidified. If necessary, decolorizing charcoal (m.p. 114°C, yield: roughly 91%) can be employed. This procedure does not require the use of any chemical.[9]

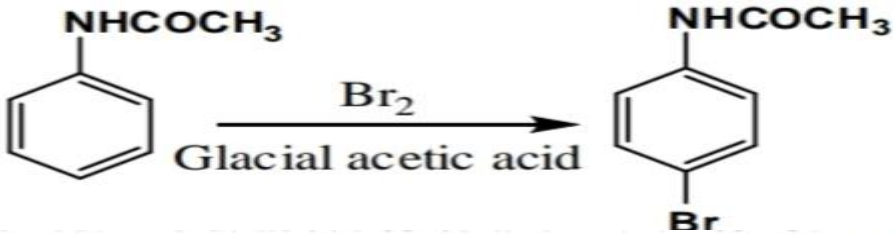
Green context - Avoids the use of acetic anhydride (which is prohibited in some places due to its use in the narcotics industry), as well as waste by-products and dangerous solvents.[10]

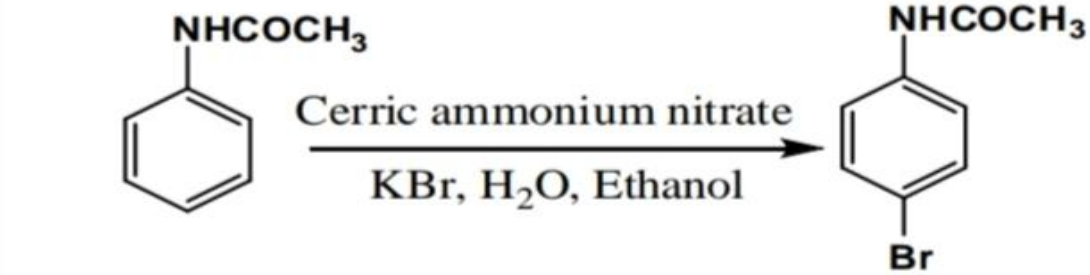
2.Electrophilic aromatic substitutions reaction ll (Bromination of Acetanilide)

Principle - When bromine is added to acetanilide, it produces a combination of o- and p-bromo acetanilide (As compared with aniline which gives a tribromo derivatives). It's the inductive effect of the acetyl group's carbonyl group, which somewhat deactivates the benzene ring in this situation. This is a classic electrophilic aromatic substitution process.[11] Di- and tri-substituted compounds can result from an amine. Mono substitution frequently predominates when an amide is employed instead of an amine (the electron-withdrawing carbonyl group makes the benzene ring less nucleophilic). Because of the amide group's steric mass, this ortho-, para-directing group will tend to only add groups to itself.[12]

Conventional method –

Green procedure - Acetanilide was dissolved in ethanol in a conical flask. Water was then added to dissolve potassium bromide





and ceric ammonium nitrate. This solution was poured into a funnel for addition. Drop by drop, this solution was added to the acetanilide solution in the conical flask. Following the completion of the addition, the White crystals formed after stirring the reaction mixture for 10 minutes at room temperature. Then consider this option. A glass of ice-cold water was poured into The solid was separated from the white crystals using a Buchner funnel.dry. M.P. 165°C and yield of about 85 percent.[13]

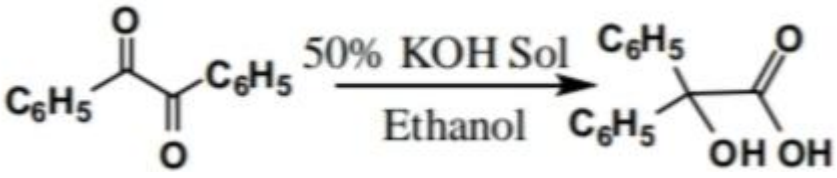
Green context- Bromination is carried out in an aqueous medium, chlorinated solvents are avoided, acetic acid as a solvent is avoided, and the reaction is significantly faster.[14]

Note- In the identification of chemical molecules, this reaction can be utilised to make bromo-derivatives of acetanilide.

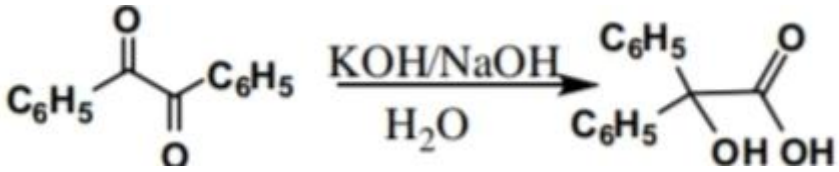
3.Rearrangement reaction-lll (Benzil Benzilic acid rearrangement)

Principal -KOH and ethanol at 100 0C are often used to make benzilic acid. The skin, eyes, and gastrointestinal tract are all affected by potassium hydroxide. Higher levels of exposure can lead to a build-up of fluid in the lungs, which can lead to mortality. Another disadvantage of the typical approach is that benzil is refluxed with ethanol, necessitating additional time and energy to remove the ethanol. As a result, we developed a green, solvent-free, and atom-efficient benzilic acid production technique.[15]

Convention method- Benzilic acid is produced by reacting benzil with KOH and ethanol. Solvents are employed because they are not atom efficient.[16]



Green approach - To make an easy flowing powder, benzil was extensively pulverised in a dry mortar with solid NaOH or KOH and a pestle. After that, the material was placed in a dry conical flask with a cotton swab at the mouth and heated[17] over a boiling water bath.20 minutes in the water bath Then it was brought to room temperature and dissolved in as little water as possible.(Filtration was used to remove any unreacted benzyl) and the aqueous solution was acidified with conc.HCl, cooled in ice for a long time. The benzilic acid that had precipitated was filtered, rinsed in cold water, and then dried. If necessary, it can be crystallised using hot water. M.P. 149-151°C, with an approximate yield of 80%.[18]



Green context -The technique is solvent-free and atom-efficient.

Discussion - Clean chemical processes, such as synthetic procedures and reaction conditions, are required to minimise environmental impact. Green chemistry is being developed to meet these goals, and it is based on novel and unconventional synthetic processes, such as reactions in water and supercritical fluids. ionic liquids, micro emulsions, solvent-free environments, ultrasounds, and microwaves must all be used to manufacture regio and stereo selective products with excellent yields. [19] Planning new processes and creating new ecologically friendly materials are just two aspects of the "green chemistry" concept.It also necessitates a new chemical mindset, as well as new energy and research development policies In today's society, scientists are concerned and working to develop and find new environmentally friendly technologies Methods for synthesising organic molecules.[20]

Conclusion- Conventional approaches need to be changed or modified because they are not environmentally friendly, use dangerous solvents, and are not atom specific in the sense that they do not adhere to green chemistry principles. This is environmentally friendly and might be helpful for student safety. For unconventional methods of organic synthesis, a new strategy has recently been developed.The field of green chemistry is expanding quickly and offers a proactive path toward the sustainable development of future science and technology that can be helpful in the design of Effectively and sustainably made synthetic Procedures/practices for giving life-saving medications and for Accelerate drug discovery lead optimization processes while Reducing environmental devastation It also provides improve process economics, as well as a reduction in the number of chemicals used A disease caused by the environment The benefits of the environment-friendly syntheti

substitutes based on novel techniques,synthetic.The use of environmentally beneficial technologies like eco-friendliness Water and other solvents are becoming common, and The chemical and pharmaceutical industries may use to Avoiding the use of volatile organic solvents by reducing or eliminating them To reduce reaction time and pollution at the source,Removal or reduction of adverse effects.

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