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Green Chemistry Practices: Focus and Review

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Abstract:

Green chemistry is one of the most important research fields and has appealed most of the researchers. The practice of green chemistry in chemical synthesis can lessen the demolition of the environment arise by the use of hazardous chemicals. With the expanding need of environmental protection, the use of green chemistry approach in organic synthesis is essential. Green chemistry makes use of its own principles that lower the use and production of hazardous substances generated during the synthesis and also connects with the environment. The use of green Chemistry approach in organic synthesis based on three of the twelve principles of Green Chemistry namely use of greener solvents, elimination of harmful byproducts and atom economy.

Keywords

Green Chemistry, Greener solvents, Atom economy,

1. Introduction

In recent years, the environment is polluted with risky and hazardous chemicals. In chemical industries the organic reactions are initiated by utilizing diverse chemical reagents. The waste from these industries specifically blends with usable water and subsequently contaminates the earth. The contamination has gotten the consideration of such huge numbers of scientists and in this way presents new idea i.e. Green chemistry. The term 'green chemistry' was first used by P. T. Anastas, for accomplishment of improvement in chemistry and chemical industry [1].

The primary goal of green chemistry is substitution of harmful solvents by greener one and utilization of synthetic techniques, separation and purification which does not require any kind of solvents. In organic synthesis, solvents perform a vital role, it goes about as a liquid medium for the reaction and furthermore fundamental for the extraction, cleansing and drying of chemical product. A large number of the organic solvents are perilous and toxic causing ecological issues. The drawn out utilize and high introduction of toxic solvents prompts cancer-causing nature [2].

2. Principles of Green Chemistry

The green chemistry intends to dispose of the hazardous and toxic waste produced in the chemical process and furthermore to ensure our wellbeing and environment by discovering improved chemical techniques [3]. The twelve principles of green chemistry provide a way for researchers to implement green chemistry. It is most imperative for a chemistry expert to complete organic synthesis by following pathway with the goal that generation of hazardous or toxic waste is prevented. By avoiding generation of toxic substances we limit the danger of waste stockpiling, transportation and its treatment.

The efficiency of chemical transformation in light of the principle of green chemistry was introduced by Bary Trost of Stanford University in term of atom economy. Atom economy is the ratio of total mass of atoms in desired product to the total mass of atoms in the reactant. To reduce the hazardous or toxic byproduct, the chemical process is designed in such a way that it make use of all the materials used in the reaction to convert into the final product resulting in few byproduct atoms.A

In organic synthesis, synthetic strategies ought to be planned keeping in mind the end goal to utilize and create substances that have almost no harmfulness to human wellbeing and environment. For a specific change number of reagent alternative exists. The principles of green chemistry center around the determination of reagents that reason minimum hazard and create just valuable results.

In laboratories and chemical industry, the utilization of organic solvents creates perilous and dangerous waste which influences over the wellbeing security of workers and ecological contamination [4]. To keep away from the harmful impacts of organic solvents the new idea of green solvent is presented, which is non- toxic and favorable to environment [3]. Consequence of work exhibited by Capello et al on 26 organic solvents have revealed that basic alcohols (methanol, ethanol) are ecologically best solvents, though the utilization of dioxane, acetonitriles, acids, formaldehyde and tetrahydrofuran are not recommendable from a natural point of view [5].

Because of toxic quality of reagents the designing of more secure chemicals is essential. There is a relationship between's chemical structures i.e. occurrence of functional groups and the presence of toxic impacts. The new products can be designed that are inalienably more secure while very compelling for object application [6]. To elude the creation of hazardous/ toxic waste utilization of harmless solvents ought to be considered, for instance water, supercritical carbon dioxide. Lessening or elimination of solvents is some time possible while in the cases where solvent is essential, less hazardous solvents should be utilized.

Some chemical reactions require energy to get completion which has an effect on environment. Hence energy constraints of chemical reactions should be minimized for environmental or economic effects. In the conditions allow, the new engineered techniques ought to be run at the ambient temperature and pressure. Whenever viable, the chemical process should be designed to make use of raw materials that are renewable.

Some chemical process generates hazardous derivatives and thus requires additional reagents. Such excessive derivatisation should be reduced or avoided. Products of the chemical process should be designed in a way that, at the end by their properties they break down into degradation products and do not continue in the environment. It is every time imperative to screen the advances of the reaction to know when the reaction concludes or to recognize the fabrication of undesirable products [7]. Strategies and innovations ought to be produced with the goal that the avoidance or minimization of generation of hazardous waste is accomplished.

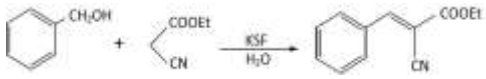
The reagents and solvents ought to be specifically selected to reduce the potential for chemical mishap such as blasts, fires and so forth. These unintended dangers might be lessened by varying the state (solid, liquid, or gas) or constitution of the regents..Green chemistry assumes an imperative part in chemical transformation, by supplanting unsafe regents it decreases the effect on environment and in addition cost of the procedure. The selection and use of another catalyst and catalytic system are at the same time accomplishing the twofold objectives of environmental security and monetary advantage. The basic objective of green chemistry is the substitution of replacement of highly corrosive hazardous and polluting acid catalyst replacement of highly corrosive hazardous and polluting acid catalyst with eco-accepting and sustainable catalyst.

3. Applications of Green Chemistry

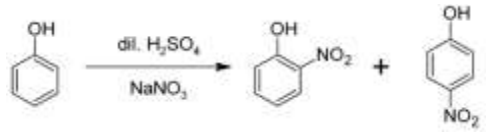
Selective examples and the brief description of common preparations are given here, that how these could be safer and environmentally friendly.

(a) Conventional method for preparation of 2-cyano, 3-phenyl, acrylic acid ethyl ester involves non-green solvent toluene and toxic piperidine,

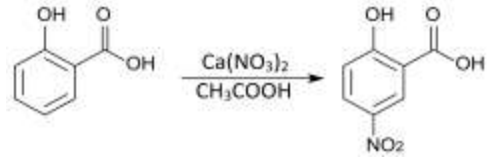
Whereas, in green practices KSF is used, this is solid acid catalyst and renewable [8].



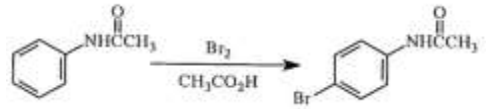
(b) Nitration of phenol accomplished conventionally by non-green sulphuric acid.



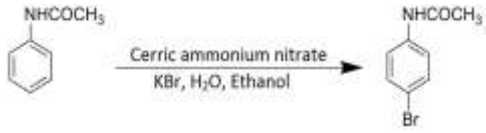
In greener approach, calcium nitrate solution in warm acetic acid added to salicylic acid, and the resulting mixture is heated and poured into ice cold water to obtain nitro product.



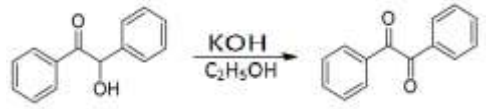
(c) Bromination of acetanilide takes place conventionally with molecular bromine, and an FeBr3 catalyst.



In greener approach acetanilide is dissolved in ethanol and solution of potassium bromide and cerric ammonium nitrate is added drop wise to this and stirred for few minutes at the room temperature. Mixture solution is then poured into water and crystals are filtered.



(d) Conventionally, benzilic acid is prepared from reaction of benzyl with KOH and ethanol.



In greener approach benzil and solid KOH are powdered in mortar which is taken in dry conical flask and heated on a water bath for 20 minutes. At that point it was cooled to room temp, dissolve little amount of water and acidified [9].

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4. Conclusion

Green chemistry has developed from a little thought into another way to deal with the logically based ecological insurance. By utilizing green chemistry standards we can change or adjust the customary techniques which are not environment friendly [10]. Scientists and pharmaceutical organizations should be urged to think about the standards of green science while designing reagents.

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