1. INTRODUCTION

Green chemistry is defined as environmentally benign chemical synthesis. It Focuses on a process that reduces the use and generation of hazardous substances or by products. Interest in green chemistry was first initiated in the United States after the passage of the Pollution Prevention Act of 1990. Subsequently the Environment Protection Agency (EPA), got involved in green chemistry.

Green chemistry is the new and emerging branch of chemistry for the environment. It is really a philosophy and way of thinking that can help chemistry in research and production to develop more ecofriendly solutions. Green chemistry is a science based on non – regulatory and economically driven approach to achieve the goals of Environmental Protection and Sustainable Development.

In view of the pollution caused to the environment by chemical Industries, there is urgent need to develop environmentally benign or green synthesis. We have known that a number of ways are now available to reduce the impact on the environment of a large scale process. These include correct choice of starting materials ,use of green solvents (as far as possible) and using appropriate reagent. The reaction Should be conducted in safer aqueous system instead of hazardous organic solvents. The reactions, as far as possible should be carried out at ambient temperature instead of using heat energy. If possible, the material should be recycled. The pathways for synthesis be selected so that the generation of toxic material is avoided.

It is best to carry out reactions in aqueous media. Water is the cheapest abundantly available solvent and the reactions in aqueous media are generally environmentally benign

The principles of green chemistry are a significant beginning for the chemical Profession in dealing with this novel concept for the betterment of the environment . These are:

1. It is better to prevent waste than to treat or clean up waste after it is formed.

2. Synthetic methods should be designed to maximize the incorporation of all Materials used in the process into the final product.

2. Wherever practicable synthetic methodologies should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

4. Chemical products should be designed to preserve efficiency as function while reducing toxicity.

5. The use of auxiliary substances should me made unnecessary whenever possible and when used innocuous.

6. Energy requirement should be recognized for their environmental and economic Impacts and should be minimized synthetic methods should be conducted at ambient temperature and pressure.

7. A raw material or feedstock should be renewable rather than depleting whenever technically and economically practical.

8. Unnecessary derivatization (blocking group , protection or de-protection , temporary modification of physical or chemical processes) should be avoided whenever possible

9. Catalytic reagents (as selective as possible) are superior to stochiometric Reagents.

10. Chemical products should be designed so that the end of their function they do not persist in the environment and instead breakdown into innocuous degradation products.

11. Analytical methodologies need to be further developed allow for real time in process monitoring and control prior to the formation of hazardous substances

12. Substances and the form of substance used in the chemical process should be Chosen so as to minimize the potential for chemical accidents , including releases , explosions and fires.

The principle of green chemistry can be applied broadly to areas like synthesis, Catalysis , reaction conditions analysis and monitoring extraction , separations, computational chemistry and process modeling etc.

The objective of green chemistry is not only to design new green synthesis (environmentally benign synthesis) but also to devise green methods for the synthesis of already existing products , whose synthesis are responsible for environmental pollutions.

Green chemistry experiments are introduce not to drastically replace the conventional ones rather , they are considered complementary to the existing protocols. This not only provides a wider view of various technique but also imbibes inquest in innovative minds for future development and growth of the subject in general with due emphasis to green chemistry context

As chemical philosophy , green chemistry applies to inorganic chemistry , inorganic chemistry , biochemistry , analytical chemistry , even physical chemistry , while green chemistry seems to focus on industrial applications , it does not apply to any chemistry choice. The focus is on minimizing the hazard and maximizing the efficiency of any chemical choice.

In any synthesis, the starting materials are made to react with a suitable reagent under appropriate conditions. Before deciding on the route be followed for any synthesis, consider all possible methods that can give the desired product. The method of choice should not use any toxic starting materials and should eliminate the formation of byproducts and wastes. Following are some of the important considerations.

1. Choice of starting materials
2. Choice of reagents
3. Choice of catalysts
4. Choice of solvents

The concept of addresses environmental issues in an economically profitable manner. Green chemistry makes it more or less mediatory for the industries to see that appropriate starting materials and conditions to be used so that there are no hazardous by product generation. This aspect forms the subject matter of a subsequent section.

Green chemistry emerged from a variety of existing ideas and research efforts (such as atom economy and catalysis) in the period leading up 1990's in the context of increasing attention to problems of chemical pollution and resource depletion. The development of green chemistry in Europe and the United States was linked to a shift in environmental problem solving strategies:

A movement from command and control regulation and mandated reduction of industrial emissions at 'end of pipe' towards the active prevention of pollution through the innovative design of production technologies themselves.

Let us think green chemistry make chemical pollution prevention our motto and save the environment from hazardous chemicals

2. OBJECTIVES

To synthesis organic compounds through following procedure ie, by avoiding hazardous solvents and by products , minimizing the use of energy and thereby promoting synthesis in an ecofriendly manner.

1. PREPARATION OF 1 , 1 – bis – 2 – naphthol

Chemicals required

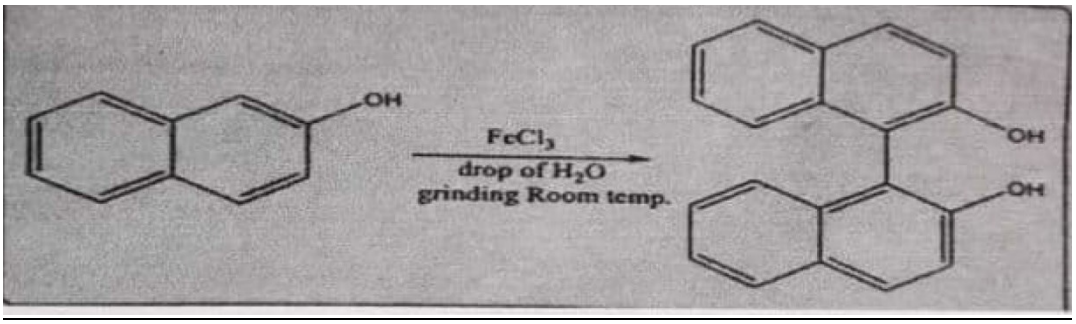
1. 2 – Naphthol - 2.88 g
2. Iron (III) chloride – 0.7 g
3. Water – 2 drops
4. Toluene (for re – crystallization)

PROCEDURE:

A mixture of 2 – naphthol (2.88 g) and iron (III) chloride (0.7 g) with 2 drops of water in an agate (or porcelain) mortar pestle was grinded for about 20 minutes. The mixture was allowed to stand for about 2 hours with a little grinding now and then. The mixture was transferred with water (40 ml) into a 100 ml beaker and boiled for 10 – 15 minutes. The mixture was cooled and the solid was filtered washed with boiling water (10 ml) , dried and re – crystallized from toluene.

M.P – 214 – 217° C

Yield – 3.9g(90%)



3. SYNTHESIS OF BIODIESEL – FROM VEGETABLE OIL

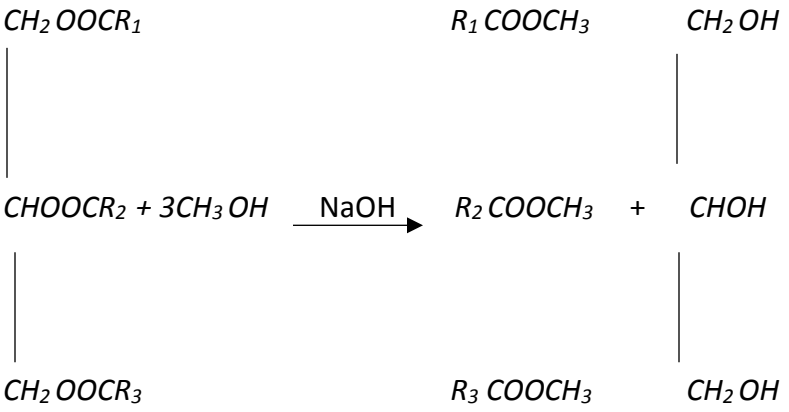
Chemicals required

- Vegetable oil – 100 ml
- Methanol – 20 ml
- Sodium hydroxide – 3 pellets

PROCEDURE:

The finely ground anhydrous NaOH was added into pure (99% or higher purity) methanol (20 ml) in a 250 ml beaker and stirred vigorously until all the NaOH was dissolved. The pure vegetable oil (100 ml) was warmed to about 40° C in a 250 ml beaker. The warmed up oil was poured into the methoxide solution with continuous stirring. At first the mixture would become cloudy , but should soon two layers would separate. This was stirred for 15 – 20 minutes. The mixture will separate into two different layers. The glycerol will fail to the bottom , and the methyl ester (biodiesel) will float to the top. Allow the experiment to sit for an hour. The stopcock of the separately funnel was opened and the glycerol was allowed to drain into a small beaker.

Yield : 70 ml



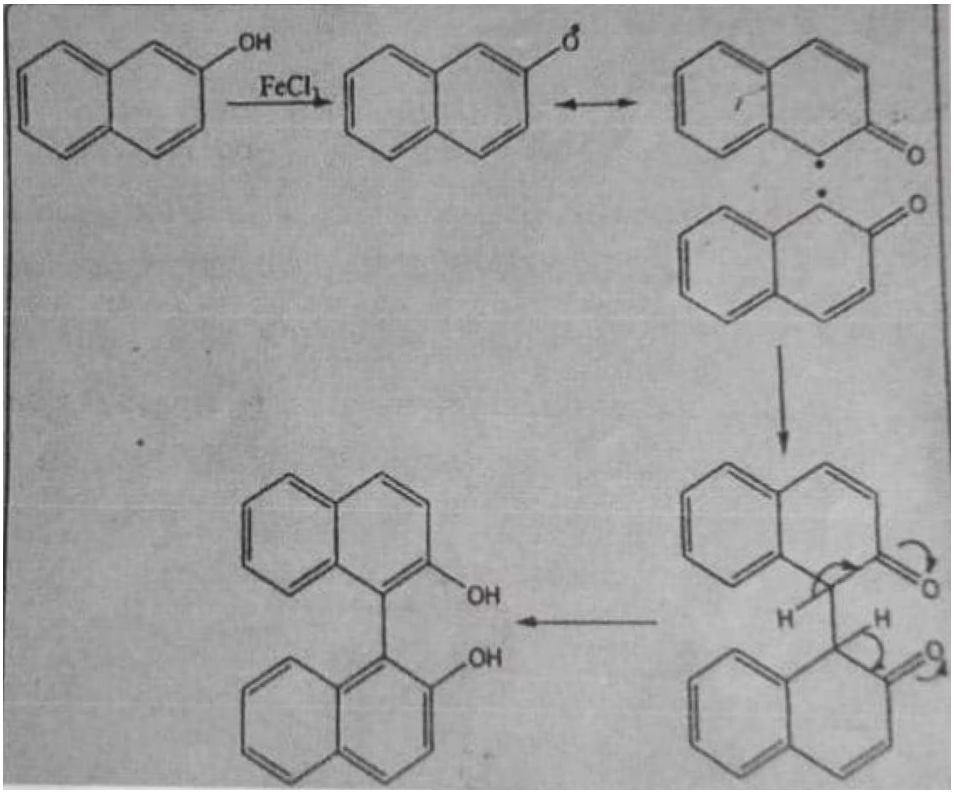
Triglyceride Methanol Methyl ester Glycerol

4. RESULTS AND DISCUSSIONS

Green synthesis has proven to be useful in organic preparations of compounds such as Acetanilide , 1 , 1 – bis – 2 – naphthol , biodiesel (methyl ester) etc.

In conventional methods for the preparation of certain organic compounds , the reagents used are mostly non – green components where as green procedure avoids or minimize the use these compounds.

In a case of 1 , 1 – naphthol , conventional method involve use of more energy whereas in green procedure , reaction is performed with simple grinding at room temperature without any solvent.



The mechanism of synthesis of biodiesel via 2 – step transesterification process is represented as ,

Acid esterification (step 1)

$$RCOOH + CH_3OH \xrightarrow{H_2SO_4} RCOOCH_3 + H_2O$$

Acid esterification (step 2)

$$\begin{array}{lll} CH_2OOCR_2 & R_1COOCH_3 & CH_2OH \\ | & & | \\ CHOOCR_2 + 3CH_3OH \xrightarrow{NaOH} & R_2COOCH_3 + & CHOH \\ | & & | \\ CH_2OOCR_3 & R_3COOCH_3 & CH_2OH \end{array}$$

Triglyceride Methanol Methyl ester Glycerol

Transesterification is a process in which the alcohol , usually methanol or ethanol is used to break the triglycerides into methyl esters , the renewable biodiesel. This process can be conducted in either the presence or absence of acid / alkali based catalyst.

The use of waste cooking oil in production of biodiesel offers significant advantages because of the reduction in environmental pollution. The good think about used cooking oil is that it can be recycled. Some of the fields that will benefit from recycling used cooking oil include Information Technology. Engineering , Sales , Marketing, Accounting and Training among others.

" The use of Biodiesel will result in the decline of Green house gas emissions from vehicles and industries in 90% or more "

5. CONCLUSIONS

The ultimate aim of green chemistry is to entirely cut down the stream of chemicals pouring into the environment. This aim seems unattainable at present, but progress in the green chemical research areas and their application through successive approaches will certainly provide safer speciality chemicals and much more satisfactory proceses for chemical industry. Green synthesis can be used as a substituent for conventional methods. It is an excellent method as it is environmentally friendly.

6. REFERENCES

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