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Comparative Study of some Synthetic Reactions with Green Aspects

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ABSTRACT

On the basis of green chemistry, minimum utilization of energy that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products. Different green approach of synthetic reactions like Vilsmeier Haack formylation, Benzoylation, Salicylic acid to Aspirin, Acetanilide to p-Acetamide sulphonyl chloride carried out by sonication. Evidence of product and purity confirmed by thin layer chromatography and melting points.

Keywords : Vilsmeier Haack formylation, green chemistry, Sonication

I. INTRODUCTION

Green Chemistry provides a unique forum for the publication of innovative research on the development of alternative sustainable technologies. The scope of Green Chemistry is based on, but not limited. On the basis of green chemistry definition minimum utilization of energy that reduces or eliminates the use or generation of hazardous substances in the design, manufacture and application of chemical products. Green Chemistry is at the frontiers of this interdisciplinary science and publishes research that attempts to reduce the environmental impact of the chemical enterprise by developing a technology base that is inherently non-toxic to living things and the environment. Submissions on all aspects of research relating to the endeavor are welcome. The journal publishes original and significant progressive research that is likely to be of wide general appeal. To be published, work must present a significant advance in green chemistry. Exposure includes the following aspects as the application of innovative technology to establish industrial procedures. The development of environmentally improved routes, synthetic methods and processes to important products. The design of new, greener and safer chemicals and materials. The use of sustainable resources, the use of biotechnology, alternatives to chemistry-based solutions, methodologies and tools for measuring environmental impact and application to chemical aspects of renewable energy.

II. METHODS AND MATERIAL

Procedure:

Routine Procedures of some reactions:

1.Vilsmeier Haack formylation:

In round bottom flask, take 1.2 ml DMF. Cool it in ice bath, then add into it 1.2 ml POCl3 with constant stirring. Viscous liquid formed then add 1.0 gm 2-methoxy Naphthalene in one lot. Attach air condenser with guard tube. Heat reaction mixture using water bath about 2 hrs. pour reaction mixture

in ice cold solution of sodium acetate for decoloration and maintained stirring with glass rod for 15 minutes. Solid white coloured compound is formed. Recrystallize it with ethanol and monitored by M.P and TLC.

Green approach: This reaction carried out at sonicator for 15 mins under sonication. Time effective and fuel saving with less hazardous.

2. Benzoylation:

Dissolve 1gm glycine in 10 ml 10% NaOH containing in conical flask. Add 2ml Benzyol chloride in one portion to the above solution. Put cotton plug on conical flask and shake vigorously for 10 mins. Add crushed ice to this reaction mixture and acidify with conc. HCl. Check with Congo red litmus paper. Filter crude product and wash with cold water.

Green approach: Instead of NaOH preferred the use of LiOH which is less corrosive and hazardous and in sonication reaction time reduced upto 5 mins.

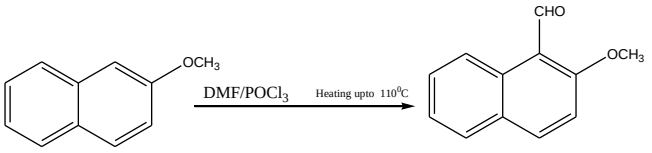
3. Salicylic acid to Aspirin:

Place 3.0 gm of Salicylic acid in 100 ml Erlenmeyer flask. Add 6 ml of acetic anhydride and 5 drops of conc.H_2SO_4. Mix the above mixture and heat the flask in a water bath which is warm up to 80-90^{0}C for 10 mins. Remove the conical flask and allow cooling to room temperature. Add 40 ml water and keep it in ice water bath. Wash the product with cold water.
Green approach: Fuel saving and instead of Acetic anhydride we used Maleic anhydride.

4. Acetanilide to p-Acetamide Sulphonyl Chloride:
Take 2 gm of acetanilide in round bottom flask fitted with water condenser and guard tube. Add 5 ml chlorosulphonic acid, then heat the reaction mixture in water bath for 60 mins. After cooling the reaction mixture, pour it in crushed ice. White granular solids are formed. Wash with cold water.

Green approach: Time period of reaction reduced from 60 to 15 mins.

Reaction 1st :



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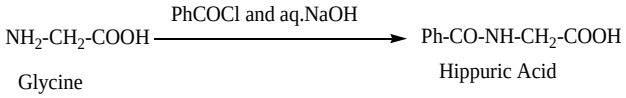

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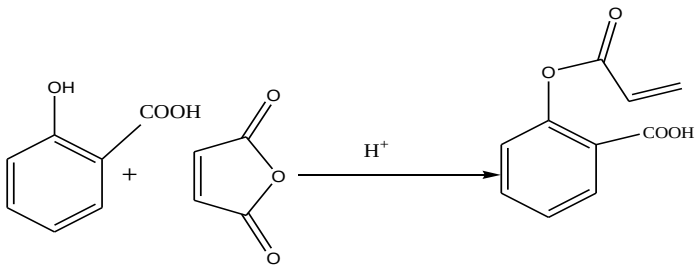
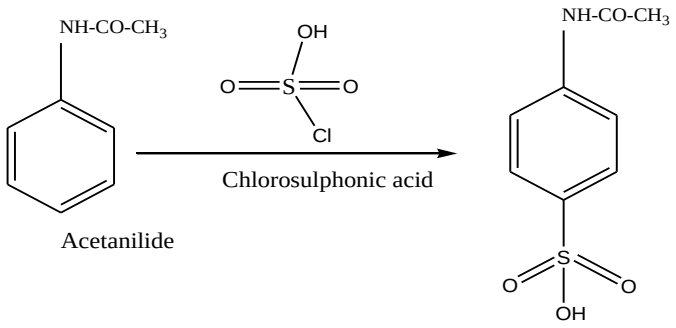


Reaction 4th :



III. RESULTS

Sr. No.	Name of Reaction	R_f value of Reactant	R_f value of Product	Physical Constant (^0C)	Practical yield of Product (%)
01	Vilsmeier Haack formylation	0.69	0.51	78-82	92
02	Benzoylation	0.60	0.55	186-188	88
03	Salicylic acid to Aspirin	0.52	0.67	136-138	89
04	Acetanilide to p-Acetamide Sulphonyl Chloride	0.56	0.72	140-142	87

Compound	1	2	3	4
Name of Product	1-formyl-2-methoxy naphthalene	Hippuric acid	Aspirin	p-acetamide sulphonyl chloride
Physical Constant	78-82 ^0C	186-188 ^0C	136-138 ^0C	140-142 ^0C
TLC				
Solvent used for TLC	MobilePhase: n-Hexane	MobilePhase: n-Hexane	MobilePhase: n-Hexane + Ethyl acetate (7:3)	MobilePhase: n-Hexane + Ethyl acetate (8:2)

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